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ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

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ANNALS OF SURGERY

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No. 1

ORIGINAL MEMOIRS.

OF LIGATURE OF THE INNOMINATE ARTERY.

WITH REPORT OF A SUCCESSFUL CASE.

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1. *Introduction.*—Prior to the present case, ligature of the innominate artery had been performed successfully seven times, viz., three times in the United Kingdom, three times in the United States, and once in India. The writer's case, therefore, seems worthy of record, and a study of the literature of the operation leads further to the conclusion that the process of collecting and commenting upon the accounts of previously recorded cases will also be instructive and will form an interesting chapter of surgical history. This, therefore, has been carried out, and every effort has been made to render the collection of cases complete, and to omit no essential points in their record. In spite of its previous high mortality, the operation is one which, under modern surgical conditions, the writer believes has a safe and useful future.

2. *Summary of Present Case.*—The patient, a man aged forty-six years, a laborer, formerly a soldier, was admitted to the Cardiff Infirmary on February 2, 1904. He had an aneurism of the second and third parts of the right subclavian artery, the symptoms of which commenced six months previous to admission. On March 31, 1904, the innominate and the right common carotid

arteries were tied. Pulsation ceased in the aneurism, but was found to have returned to some extent on the following day. On May 19 an unsuccessful attempt was made to again tie the innominate. On June 2 the second part of the subclavian was tied close up to the aneurism. Recovery took place with consolidation of the aneurism, and the man remained well when last seen, eight and one-half months after the first operation.

3. *Account in detail of Present Case.*—W. T., male, aged forty-six years, admitted to the Cardiff Infirmary, February 2, 1904, being sent by Dr. T. W. Thomas, of Caerphilly, near Cardiff.

History.—Laborer since 1885; previous to that in the army, having served in the Bermudas and in the Egyptian campaign of 1882-1884. No history pointing to venereal disease. Has heavy straining work to do. Has never had a blow at the site of the aneurism. Admits alcoholism.

Present Trouble.—This began six months before admission, with numbness and tingling in the right hand; these symptoms have persisted and become more marked, the numbness and tingling extending up the arm. Sometimes the pain in the arm is so great that he cannot raise his hand to his head. He did not notice the swelling until January 27 (six days before admission), and he attributes its presence to a "jar of the hammer" with which he was working on that day. He worked until January 30, then reported himself ill, and was sent to the Infirmary.

On Admission.—The general appearance is shown by the photograph (Fig. 1). He is a fairly strongly built man, but pallid and with flabby muscles.

Aneurism.—Pulsating swelling above clavicle in situation shown in photograph; projects more from the general surface, and is more marked in all respects when the patient sits up than when he is lying down; pulsation heaving, expansile, not forcible; systolic bruit; slight rise and fall during respiration; general form circular, with an upward and outward expansion; greatest breadth, 6 centimetres; height of upper margin above clavicle, 5 centimetres; centre raised above general surface 1.5 centimetres; overlapped anteriorly by sternomastoid and posteriorly by trapezius; lower margin lies behind clavicle, but finger can be got between clavicle and swelling; pressure causes shooting-pains in axilla; no dulness over manubrium sterni.

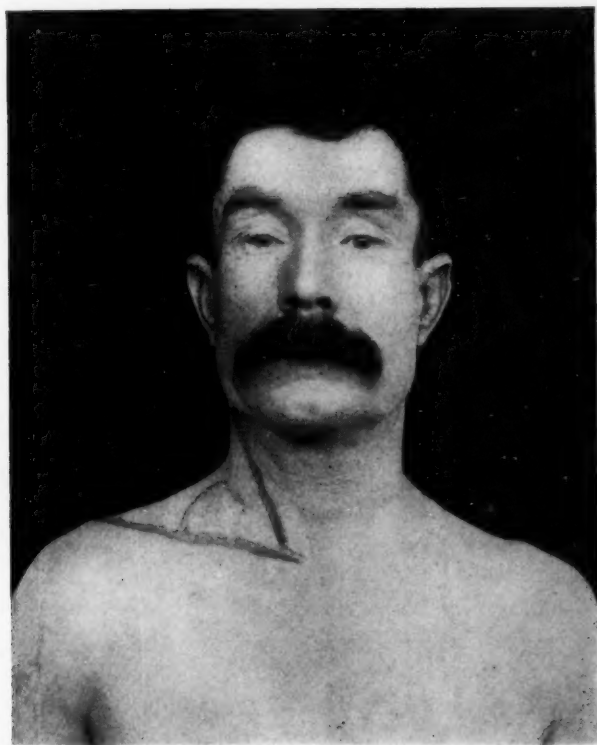


FIG. 1.—The patient before operation. The outline of the aneurism, the upper border of the clavicle, and the inner margin of the sternomastoid have been marked in India ink.

Pressure Symptoms.—The radial pulse is only just perceptible, requiring great care in order to feel it; the same observations apply to the brachial and axillary pulses; the radial pulse-rates are equal; there is no difference between the carotid or the temporal pulses on the two sides.

The veins are slightly dilated over the upper and outer part of the right chest and over the front of the right shoulder; there is a dilated vein running up the front of the arm over the middle of the biceps muscle. There is no œdema of the arm.

There is pain over the scapula. Tingling pains run down the arm from the axilla. "Dead fingers" and "cramps" are complained of in the hand. The fingers of the hand have a bluish-white, "dead" appearance as compared with those of the opposite side. The pupils are equal and react to light and accommodation. There is no alteration in the voice and no cough.

Other Symptoms.—Heart. Apex beat palpated with difficulty in fifth space in nipple line; otherwise normal. Arteries not atheromatous. Left radial pulse good volume; rate, 66. Lungs normal; breathing quiet, sixteen to the minute; no expectoration. Occasional dyspeptic symptoms,—pain and flatulence. Slight enlargement of liver. Urine normal. No swelling of feet. Evidence of venereal disease, none. The whole body was carefully examined.

Subsequent progress prior to operation. The patient was found to be suffering from scabies, with the accompanying eczema and numerous "boils" about the body and limbs. This necessitated a prolonged course of treatment. The aneurism increased slightly in size. The pressure symptoms varied from day to day, but underwent no marked exacerbation. The patient was usually allowed up daily and had a generous diet without stimulants.

Operation, March 31, 1904, two months after admission. The greatest care was taken to secure asepsis. The preparation of the patient's skin was commenced forty-eight hours before the operation. The operator, assistants, and nurses wore sterilized cotton gloves, and were clothed in sterilized linen overalls. The anæsthetist was screened off by a sterilized linen cloth stretched over a copper wire framework. Only the situation for the incision and the skin immediately adjacent were exposed, the sterilized cloths being stitched to the skin around this area. Pieces of sterile gauze were used for swabs. Knives and scissors were

sterilized by immersion in and wiping with carbolic lotion; other instruments by boiling. Needles had been previously prepared, and were stored in absolute alcohol. With the exception of the silk used for the innominate itself, ordinary Chinese twist was used throughout for ligatures and sutures, which had been prepared by boiling and was stored in absolute alcohol.

Chloroform was administered by Dr. F. W. S. Davies. Mr. William Martin, Assistant Surgeon to the Infirmary, and Mr. Brownlee, Resident Medical Officer, assisted the operator.

A median incision was made five inches long, extending from over the cricoid cartilage to an inch below the sternal notch. The cervical fascia was divided, and the sternolaryngeal muscles separated in the middle line and drawn apart throughout the length of the incision. The lateral lobes and the isthmus of the thyroid were exposed in the upper part of the wound. The operator, who had been standing on the right, now crossed over to the patient's left side and worked standing near to the patient's left shoulder. The dissection was carried well into the sternal notch, and a long process of tissue, probably remains of the thymus gland which lay laterally along the right side of the trachea, was removed. This process showed communicated pulsation, and was at first thought to be the carotid. The carotid sheath was next identified and opened, and the carotid followed down to the bifurcation; in doing this the thyroidea ima vein had to be divided between two ligatures. An attempt was now made to clear and identify the first part of the subclavian, it being thought it might be possible to apply a ligature to this; but, while a long narrow-bladed retractor was being adjusted to open out the lower and outer angle of the wound, a slight hissing sound occurred from this situation, indicating probably wound of the pleura: this ceased on packing in a gauze plug, but recurred when the gauze was removed. The patient gave no signs of being affected by the incident. The gauze being left in, the dissection was carried to the innominate, about half an inch of which was exposed lying obliquely against the right side of the trachea, and by means of a right-angled needle (Macewen's hernia needle) a ligature of stout floss-silk (Down Brothers, London, No. 2 pearl silk) was carried round the vessel from without inward. There was no especial difficulty about this performance, and no means of illuminating the situation of ligature additional to the ordinary daylight in the operating theatre

were needed. The silk was passed double round the artery, and the two ligatures thus provided were tied in Ballance's "stay knot," the first turn of a reef being taken in each in the same direction, and then the knot completed by treating the two ends on each side as one in making the second turn. The intention in tightening the ligature was to occlude the artery without injuring its coats. A fair amount of force was required before the pulsation in the aneurism ceased. On tightening, the anæsthetist observed the disappearance of the temporal pulse, and also noted that there was no increase of pallor on the right side of the face, no sweating of the face, and no change in the right pupil. The carotid was found flaccid, empty, and not pulsating, and a single length of Chinese twist was tied round it in a "surgical knot."

The parts fell together easily. The sternolaryngeal muscles and the cervical fascia were brought together by interrupted sutures. The hissing sound referred to above returned when the gauze plug was removed, but ceased on the application of the deep sutures. The skin wound was closed with a continuous silk suture without drainage, and sealed with sterile gauze and collodion, over which sterile gamgee tissue was fastened with broad bands of strapping. The operation lasted nearly two hours. Some time was lost owing to the patient several times partly coming round from the anæsthetic. It was impossible for the anæsthetist to observe the patient properly when he was screened off in the way above mentioned. Great caution also was observed in the various steps of the operation.

On recovering from the anæsthetic, the patient was extremely restless, requiring two nurses to restrain him, chattering nonsense, and not recognizing those about him. He was given sips of milk and water and vomited twice. At 7 P.M. his temperature was 98° F.; pulse, 88; respirations, 24. At 8.30 P.M. he was given one-quarter grain of morphia hypodermically, after which he was quieter and slept at intervals, complaining of great pain in the region of the heart when awake. The mental disturbance and restlessness continued for the next two days, gradually abating. On the morning of the day following the operation a slight return of pulsation was noted in the aneurism; this became more forcible during the next three or four days, diminished again for an equivalent period so as to be almost imperceptible, then returned again and remained, but was never so forcible as

before the operation, while the aneurism had a more solid feel. The right radial pulse could not be detected, and its return was not noted until May 17, when it could be just felt as before the operation. The wound ran a perfectly aseptic course. The sealed dressing was taken off on the eighth day and the stitches removed. All dressings were left off on the twelfth day. Temperature never above 99° F.; pulse only once above 90; respiration, normal rate. No chest disturbances. On April 14, a fortnight after the operation, the patient got up. Later he had a slight attack of tonsillitis, but on the subsidence of that his general health remained good. The pain down his arm and other pressure symptoms continued. My colleague, Dr. D. R. Patterson, kindly examined his larynx on April 26, and reported slight want of mobility of the right vocal cord. During May the patient had epigastric pain and other dyspeptic symptoms. These were to a large extent accounted for when on one occasion he was found dead drunk in the hospital garden, the absence of his radial pulse much alarming the nurse who was first called to him.

Second Operation.—This was performed on May 19. Dr. Davies gave the anæsthetic, and precautions similar to those on the previous occasion were observed with regard to asepsis. The old wound was reopened, the incision over the sternum being carried somewhat lower. The procedure was more difficult and tedious than on the former occasion on account of the cicatricial tissue present. The former ligature round the innominate was identified, and half an inch of the vessel exposed on its cardiac side. On passing the point of the Macewen's needle threaded with Chinese twist outside and then behind the vessel there was an alarming gush of blood filling up the wound. On withdrawing the needle the bleeding ceased. Several attempts were made to pass the needle, but always with the same result. It was thought that the innominate vein or one of its tributaries was wounded, these parts having become adherent to the artery as a result of the first operation. The first part of the subclavian could be felt pulsating; but it would have been difficult to define, owing to the new tissue formation, and there would have been great risk of injuring the pleura. The wound was closed as before, without drainage, and sealed.

Third Operation.—Recovery from this operation was absolutely uneventful, and on June 2 the third operation was per-

formed under similar conditions to the previous ones. A transverse incision five inches long was made above the clavicle directly over the aneurism. After incision of the fascia various superficial veins, including a large external jugular, were divided between two ligatures. The outer edges of the sternomastoid and scalenus anticus were identified and cleared. The omohyoid was a little puzzling at first, forming a long whitish cord bound down, as far as it appeared in the wound, to the clavicle: after recognition it was divided. Another large vein running deeper to and parallel to the external jugular was tied and divided. The more difficult part of the operation now commenced, the pulsating aneurism filling up the wound. The sternomastoid being retracted, the dissection was carried down between the inner side of the aneurism and the scalenus anticus, and, the latter muscle being also retracted, a small portion of artery internal to the aneurism was exposed: the artery appeared healthy and the aneurism sprang suddenly off it, having a globular form and so situated that the artery entered the internal and posterior part of the aneurismal sac. The phrenic nerve, which was clearly exposed on the surface of the scalenus, being retracted, the outer half of the scalenus was divided transversely with scissors: no disturbance of respiration took place during the process. The aneurism being held outward and the partly divided scalenus further retracted, about three-quarters of an inch of the artery was exposed and cleared: it was somewhat difficult to get a needle round, as the left hand of the operator was partly occupied in retracting the aneurismal sac, which otherwise bulged over the artery, completely hiding it. A ligature of stout (No. 4) Chinese twist was passed round the artery about half an inch from the sac and tied in a "surgical knot." Pulsation in the aneurism ceased. A second similar ligature was passed and tied distal to the first, close up against the sac. The wound was kept bloodless throughout; the parts fell together, leaving no pockets; superficial structures and skin were brought together as in previous operations, and the wound sealed without drainage.

Recovery was uneventful. The patient was restless, inclined to sit up and turn about, and had to be constantly watched. The arm was kept wrapped in wool for a week: it was not so pink under the nails as on the other side, otherwise the circulation was unaffected. There was no pulse in the arteries of the limb. The

4.—TABULAR STATEMENT OF CASES.

No.	Operator.	Place and Date of Operation.	Sex and Age of Patient.	Disease and its Duration.	Incision.	Vessels Tied.	Material of Ligature and Kind of Knot.	Result.
1	Valentine Mott.	New York Hospital, May 11, 1818.	Male, 57.	Traumatic subclavian aneurism; 2½ months.	Mott's.	Innominate.	Round silk.	Death, 26th day; sepsis; hæmorrhage.
2	Graefe.	Berlin University Clinic, March 15, 1822.	Male, 30.	Subclavian aneurism; "rapid growth."	Inner border sterno-mastoid.	Innominate.	.....	Death, 67th day; sepsis; hæmorrhage.
3	Norman.	United Hospital, Bath, 1824.	Male.	Subclavian aneurism.	.....	Innominate.	.....	Death, 5th day; acute pericarditis.
4	Arendt.	Iwanhoff Hospital, St. Petersburg, 1827.	Male, 36.	Subclavian aneurism; ? traumatic; 1 year.	Inner border sterno-mastoid.	Innominate.	.....	Death, 8th day; sepsis.
5	Hall.	Baltimore Hospital, September 7, 1830.	Male, 52.	Subclavian aneurism; 9 months.	.....	Innominate.	.....	Death, 5th day; sepsis; hæmorrhage. Needle passed through vessel.
6	Bland.	Benevolent Asylum, Sydney, New South Wales, March 26, 1832.	Male, 31.	Subclavian aneurism; 2 years.	Mott's.	Innominate.	Ligature consisted of "two threads."	Death, 18th day; sepsis; hæmorrhage.
7	Bujalsky.	Military Hospital, St. Petersburg, May 11, 1833.	Male, 56.	Subclavian aneurism.	.....	Innominate.	Tied by "tour-niquet."	Death, 5th day; sepsis.
8	Bujalsky (second case).	.....	.....	Subclavian aneurism ?.	.....	.....	.....	Death.
9	Quoted by Dupuy-tren.	Paris.	.....	Subclavian aneurism ?.	.....	.....	.....	Death, 3d day; hæmorrhage.

10	Lizars.	Royal Infirmary, Edinburgh, May 31, 1837.	Male, 30.	Traumatic subclavian aneurism; 11 months.	Innominate.	Innominate.	Death, 21st day; sepsis; hæmorrhage.
11	Hutin. (Paris.)	1842.	Male, 27.	Wound of branch of axillary, 9 days.	Innominate.	Flat ligature.	Moribund; death in 11 hours.
12	R. T. Gore.	United Hospital, Bath, September, 24, 1856.	Male, 52.	Subclavio-axillary aneurism; 3 years.	Innominate.	"Hempen ligature."	Death, 17th day; sepsis; hæmorrhage.
13	Pirogoff.	St. Petersburg, 1856.	Male, 46.	Subclavian aneurism; some years.	Innominate.		Death, 48 hours; acute sepsis.
14	Cooper.	San Francisco, 1859.	Male.	Innominate, subclavian, and carotid aneurism.	Innominate.		Death, 9th day; kidney disease.
15	Cooper (second case).	San Francisco, 1861.	Male.	Subclavian aneurism ?.	Innominate.		Death, 34th day; sepsis; hæmorrhage.
16	A. W. Smyth.	New Orleans Hospital, May 15, 1864.	Male, 33.	Subclavian aneurism; 3 months.	Innominate; carotid later; vertebral.		Recovery after sepsis and hæmorrhage; aneurism recurred; died April 6, 1875.
17	Lynch.	New York, 1867.	Male.	Gunshot wound of inter-nal carotid and vertebral.	Innominate.		Death, 12th day; hæmorrhage.
18	E. R. Bickersteth.	Liverpool Royal Infirmary, May 7, 1868.	Male, 40.	Subclavian aneurism; 3 weeks.	Innominate.	Lead clamp, then silk.	Death on 6th day; hæmorrhage.
19	A. B. Mott.	New York, August 13, 1868.	Male.	Subclavian aneurism.	Innominate.		Death, 23d day; sepsis; hæmorrhage.
20	S. B. Partridge.	Medical College Hospital, Calcutta, May 2, 1870.	Male.	Aneurism of carotid; carotid tied 13 days previously; 1½ years.	Innominate.		Moribund; death in 1½ hours.

4.—TABULAR STATEMENT OF CASES.—CONTINUED.

No.	Operator.	Place and Date of Operation.	Sex and Age of Patient.	Disease and its Duration.	Incision.	Vessels Tied.	Material of Ligature and Kind of Knot.	Result.
21	E. S. O'Grady.	Dublin, 1873.	Male.	Subclavio-axillary aneurism; 3 years.	Inner two inches of clavicle removed.	Innominate; carotid.	.....	Death in 20 hours; serous effusion into cerebral ventricles.
22	G. Buchanan.	Western Infirmary, Glasgow, June 1, 1880.	Male, 40.	Subclavian aneurism; 4 months.	Mott's.	Innominate.	.....	Death in a few minutes.
23	W. Thomson.	Richmond Hospital, Dublin, June 9, 1882.	Male, 49.	Subclavian aneurism; 10 months.	Mott's.	Innominate.	O x a o r t a ; 3 knots.	Death, 42d day; sepsis; hæmorrhage.
24	W. M. Banks.	Royal Infirmary, Liverpool, February 26, 1883.	Male, 50.	Subclavian aneurism.	Mott's.	Innominate.	Kangaroo tendon; 3 knots.	Recovery; return of pulsation 67 days later; ligation of subclavian; death.
25	Bull.	New York, 1884.	.....	Subclavian aneurism.	.....	Innominate; carotid; vertebral.	Double catgut ligatures.	Death, 33d day; hæmorrhage.
26	Bennett May.	Queen's Hospital, Birmingham, March 27, 1886.	Male, 30.	Subclavian aneurism; 17 months.	Mott's.	Innominate.	5 or 6 catgut threads; 3 knots.	Death, 18th day; sepsis; hæmorrhage.
27	Francesco Durante.	Operator's Clinique, Rome, March 25, 1887.	Male, 45.	Subclavian aneurism; 2 years.	Mott's.	Innominate; carotid; vertebral.	.....	Death, 15th day; sepsis; hæmorrhage.
28	J. Lewtas.	Murdan Hospital, Punjab, India, May 13, 1889.	Male, 20.	Traumatic subclavian aneurism; 1 month.	Mott's.	Innominate; carotid.	Catgut.	Recovery; left hospital in 43 days.

29	G. E. Twynam.	Prince Alfred Hospital, Sydney, N. S. W., 1889.	Female, 18.	Traumatic subclavian aneurism; 1 month.	Median.	Innominate; carotid.	Silk.	Death in 18 hours from cerebral lesion.
30	W. H. A. Jacobson.	Guy's Hospital, London, February, 1890.	Male, 46.	Subclavio-axillary aneurism; 1 year.	Mott's; inner end of clavicle removed.	Innominate; carotid.	Ox aorta.	Death, 10th day; bronchopneumonia; delirium.
31	C. Coppinger.	Mater Misericordie, Dublin, January 9, 1893.	Male, 53.	Subclavio-axillary aneurism.	Mott's.	Innominate; carotid.	Silk.	Recovery on July 4, 1895; no sign of aneurism.
32	C. J. Symonds.	Guy's Hospital, London, November 5, 1894.	Male, 53.	Subclavio-axillary aneurism.	Two vertical incisions joined by transverse one above clavicle.	Innominate; carotid.	Floss-silk.	Recovery. Died later of other causes.
33	H. L. Burrell.	City Hospital, Boston, January 15, 1895.	Male, 54.	Subclavian aneurism; 18 months.	Mott's; sternoclavicular joint and part of sternum removed.	Innominate.	Silk reef knot.	Recovery. Died, 104th day from heart and arterial disease.
34	B. Farquhar Curtis.	St. Luke's Hospital, New York, December 2, 1899.	Male, 53.	Subclavio-axillary aneurism; "some months."	Median; splitting of manubrium.	Innominate.	Chronic catgut, 2 threads tied simultaneously, then single clavian tied March 13, thread distally.	Recovery. Some sepsis; pulsation returned; carotid and first part of subclavian tied March 13, 1900; recovery.
35	C. A. Ballance.	St. Thomas's Hospital, London, April 15, 1902.	Male, 35.	Innominate subclavian and carotid aneurism; 6 months.	Median; splitting of manubrium.	Innominate; carotid.	Gold-beaters' skin; stay knot.	Death next day. Thrombosis of middle cerebral artery.
36	William Sheen.	Cardiff Infirmary, Wales, March 31, 1904.	Male, 46.	Subclavian aneurism; 6 months.	Median.	Innominate; carotid.	Floss-silk; "stay knot."	Recovery. Pulsation returned; ligature of subclavian, June 2, 1904; recovery.

wound was unsealed and the stitches removed on the ninth day, and all dressings were left off on the thirteenth day.

Three weeks after the operation there was no return of pulsation in the aneurism, which was hard and slightly tender. The pain down the arm was much less, and the tingling had disappeared; there was still slight numbness complained of in the tips of the fingers. On June 27 the patient got up, and on July 27 he left the hospital. He was kept under my personal observation until the middle of December, 1904, when he left Cardiff to live in Portsmouth. Marked pulsation was at first felt at the root of the neck over the innominate bifurcation, but this grew gradually less and less forcible, while the aneurismal sac became smaller and harder. The radial pulse reappeared faintly about two months after the operation.

Detailed examination on December 16, eight and one-half months after the first operation, shows the sac as a flattish, slightly tender area of the diameter of half a crown; it does not project, and there is no pulsation in it. A very feeble pulse can be felt in the right radial and temporal arteries; it is full and strong in the corresponding vessels of the left side; rate, 76. No pulse is to be felt in the right carotid or brachial arteries. The right arm is not blue, and its nutrition and general appearance are as good as those of the left. The man still complains of pain in the right arm and shoulder, of difficulty in lifting the right arm, and of some tingling down it. These symptoms, however, he is probably making the most of, for he has done no work since the operations, and continues to draw compensation for his "accident." The enlargement of the superficial veins of the right side has disappeared. The man is well nourished, but flabby and of a pallid complexion. His general health is good.

5. ABSTRACTS OF PREVIOUSLY RECORDED CASES, WITH REFERENCES.

I. VALENTINE MOTT, 1818.—M. B., aged fifty-seven years; seaman; admitted to New York Hospital, March 1, 1818. Fall a week previously upon right arm and shoulder, followed by pain and general swelling there. Swelling partly subsided; that left above clavicle at first thought to be inflammatory, but in time developed definite pulsation. Operation, May 11. "Mott's incision," *i.e.*, a transverse incision above the inner part of the clavicle terminating over the trachea, joined to a second incision along the inner edge of the sternomastoid muscle; partial division of the sterno-

mastoid in the line of the transverse wound; transverse division of the right sternolaryngeal muscles.

Subclavian found diseased. Innominate tied with a "round silken" ligature half an inch below the bifurcation. Suppuration. Ligature came away on fourteenth day. Patient up on sixteenth day. Hæmorrhages on ninth and twenty-third to twenty-sixth days. Death on twenty-sixth day. *Necropsy*.—Distal part of innominate with origins of subclavian and carotid ulcerated away. Sac contained coagula, and a carious, disunited clavicle was involved in it. (Mott: *New York Medical Repository*, vol. i, 1818. Velpeau: American Edition by Mott, 1851, vol. ii, p. 206. Poland, vol. xv, p. 76; xvii, pp. 88 and 117 (Case 99).—W. Thomson.)

2. GRAEFE, 1822.—Sailor, aged thirty years; admitted to Berlin University Clinique in autumn of 1821 with a subclavian aneurism of rapid growth. Operation, March 15, 1822. Incision along anterior edge of sternomastoid. Innominate ligatured one inch from aortic arch. Suppuration. Ligature came away on fourteenth day. When wound was nearly healed, repeated hæmorrhages, to which patient succumbed on sixty-seventh day. Fatal result contributed to by suppuration in sac, which was incised. *Necropsy* showed innominate plugged by clot. (Graefe and Walther: *Journal*, 1822, Band iii, Heft 4, p. 599. Ditto, 1825, Band iv, Heft 3, p. 587. *Medical and Physical Journal*, London, 1823, p. 475. Poland, xv, p. 76; xvii, p. 125 (Case 100).—W. Thomson.)

3. GEORGE NORMAN, 1834. Bath.—The only account is that given by Gore in 1878 in the report of his own case (12). "More than fifty years ago a similar operation was performed in this city (Bath), followed by death on the fifth day. But in that instance, although the case was in many respects favorable, the operation was overlong delayed, and was at last undertaken somewhat hastily and unadvisedly owing to the occurrence of a train of symptoms, the true character of which was altogether misunderstood and misinterpreted. They were, in fact, the signs of an attack of acute pericarditis, which was a sufficient cause of death. The state of parts about the seat of ligature as seen after death was very satisfactory and promising, as there was a firm clot on the cardiac side and no signs of suppuration in the mediastinum."

Mr. C. Noel Davis, House Surgeon, Royal United Hospital, Bath, has very kindly searched the hospital records for me, but has been unable to find any notes of this case. The specimen is in the hospital museum. The catalogue notes state that the case was one of aneurism of the right subclavian in a male patient. (Gore: *Lancet*, London, 1878, vol. ii, p. 119. Poland, xv, pp. 76 and 126 (Case 101). Ferguson's *Surgery*, Philadelphia, 1845, p. 429. Erichsen's *Surgery*, fourth edition, p. 645.)

4. ARENDT, 1827.—J. L., countryman; aged thirty-six years; admitted to Iwanhoff Hospital, St. Petersburg, December 3, 1827. Blow on right shoulder a year previously, followed by swelling, which subsided, to reappear six weeks before admission. Subclavian aneurism. Operation on or about December 24. Incision along inner edge of sternomastoid; innominate ligatured. Suppuration. Death on eighth day from "exhaustion." *Necropsy*.—Puriform infiltration of parts. Inflammation of right lung.

Ligature had cut through inner coats of innominate. Sac contained grumous blood and fibrous lamellæ. Effused lymph on brain. Liver large and soft. (Dietrich's Collection, p. 188. Poland, xv, p. 76; xvii, p. 126 (Case 102).)

5. J. HALL, 1830.—H. J., aged fifty-two years; laborer; admitted to Baltimore Hospital, 1830. Tumor above right clavicle since "first months" of 1830. Aneurism of subclavian. Ligature of innominate, September 7; artery diseased with adhesions round it; bleeding followed separation of adhesions, requiring compression. Artery tied; bleeding recurred; wound plugged and operation terminated. On September 10 patient got up and walked about. Bleeding from wound, September 11. Death, September 12, fifth day from operation. *Necropsy*.—Wound fœtid. Ligature had been carried through the coats of the innominate, making two holes. Dense clot in sac. (*Baltimore Medical and Surgical Journal and Review*, 1833, vol. i, p. 125. Poland, xv, p. 76; xvii, p. 127 (Case 103).—W. Thomson.)

6. W. BLAND, 1832.—J. M.; male; aged thirty-one years; admitted to Benevolent Asylum, Sydney, New South Wales, March, 1832. Throbbing tumor above right clavicle for two years. Ligature of innominate, March 26, 1832. Incision in direction of fibres of right sternolaryngeal muscles, with separation of their fibres; also division of sternal head of sternomastoid. Ligature, "consisting of two threads," tied so as to divide inner coats. Patient got up April 1. Discharge from wound "creamy." Hæmorrhage, seventeenth and eighteenth days. Death eighteenth day. *Necropsy*.—Innominate and carotid plugged with clot. Innominate nearly divided by ligature which remained around vessel. Hæmorrhage from subclavian distal to ligature.

In his remarks upon the case (in the postoperative treatment of which there were numerous venesections), Bland regrets that he did not bleed with a more liberal hand. (*Lancet*, London, vol. i, 1832-1833, October 20, p. 97. Poland, xv, p. 76; xvii, p. 128 (Case 104).—W. Thomson.)

7. BUJALSKY, 1833.—W. M.; male; aged fifty-six years. Patient in Military Hospital, St. Petersburg. Aneurism of right subclavian. Tumor large, extending from armpit to edge of inferior maxilla; apex covered by red skin; clavicle divided into two parts. Ligature of innominate, March 11, 1833. Vessel tied after the rules laid down by Bujalsky in "Tabulæ Anat.-Chirurg.," the artery being tied by means of a "tourniquet" (und unterband die arterie anonyma mittels des von mir erfundenen tourniquet). Incision extended almost to inner margin of sternomastoid. Operation difficult owing to scars in the neck from old scrofulous glands. Subsequently shivering, heat, and rapid pulse. Death on March 16, fifth day after operation. *Necropsy*.—Aneurismal dilatation of heart, aorta, and arch of aorta. Pus in pericardium and left pleura. (*Kriegs Medicinische Zeitung*, 1833. "Tabulæ Anatomico-Chirurgicæ Ligandarum Arteriarum Majorum Exponentes," St. Petersburg. Elephant Folio, 32 pp., 14 plates. Reference in Medical and Surgical History of the War of the (American) Rebellion. Surgical volume, part i, p. 537. Thèse Inaugurale de M. Beistigni, Paris, 1841 (communication from Velpeau). Poland, xvii, pp. 88 and 92.—W. Thomson.)

8. BUJALSKY, 1833 ? (second case).—Subclavian aneurism probably. No details obtainable. Death shortly after operation. (References as under 7.)

9. A PARIS SURGEON, 1834.—Case mentioned by Dupuytren. Hæmorrhage. Death on third day. (Dupuytren: *Leçons Orales de Clinique Chirurgicale*, p. 611, Paris, 1834.—W. Thomson. *Poland*, xv, p. 78; xvii, p. 88 (Case 106).—Souchon.)

10. LIZARS, 1837.—Case first described in the "Caledonian Mercury" of June 1, 1837, by an enterprising reporter, who was attracted by the crowd entering the Royal Infirmary to witness the operation. A. D.; aged thirty years; carter; admitted to Royal Infirmary, Edinburgh, May 28, 1837. Subclavian aneurism, size of small egg. Falls on right shoulder, fifteen and eleven months previously; on second occasion fracturing clavicle; cramps and tingling in right arm, six to seven weeks. Innominate ligatured May 31; incision along inner border of sternomastoid; right sternolaryngeal muscles cut across; both ends of ligature cut short. Pulsation returned in aneurism, but disappeared in twenty-four hours; wound suppurated; knot of ligature came away seventeenth day; hæmorrhages; death, twenty-first day. *Necropsy*.—Hæmorrhage into right side of thorax. Innominate "separated" near ligature at seat of hæmorrhage. Sac of aneurism collapsed and full of coagula. (*Lancet*, London, 1837, vol. ii, pp. 441, 445, 602. *Poland*, xv, p. 78; xvii, p. 132 (Case 105).)

11. HUTIN (Paris), 1842.—N. C., aged twenty-seven years; soldier; fighting a duel at Oran, wounded in right axilla by scissor-blade tied to end of a stick. Hæmorrhage; arrested by plugging wound, but recurred fourth to twelfth days. Third part of subclavian tied on twelfth day. Eighteenth day, hæmorrhage from axilla. Twenty-first day, subclavian ligature came away, followed by further hæmorrhage; innominate artery tied at midnight; flat ligature with an additional "ligature of reserve." Patient died eleven hours later. *Necropsy*.—Ligature had been properly applied. Original hæmorrhage from inferior thoracic branch of axillary. (*Lancet*, London, 1841-1842, vol. ii, p. 230.—W. Thomson. *Archives de Chirurgie Française et Étrangère*. *Poland*, xvii, p. 137.)

12. R. T. GORE, 1856.—D. D.; male; aged fifty-two years; baker; admitted to Bath United Hospital, September 22, 1856. Aneurism in axilla and root of neck of three years' duration; more prominent when patient lies down. Innominate tied under chloroform, September 24. Mott's incision; hempen ligature used. Slight erysipelas, fifth day; phlebitis right arm and left leg, eleventh day; suppuration; rigors; cough; arterial hæmorrhage on October 10 (seventeenth day), causing death in an hour. *Necropsy*.—Innominate partly cut through by ligature. Innominate and carotid plugged by clot. Aneurism filled with a firm coagulum. Pus in anterior mediastinum. (*Lancet*, July 27, 1878. *Poland*, xv, p. 78; xvii, p. 136 (Case 109).)

13. PIROGOFF, St. Petersburg, 1856.—Male; aged forty-six years. Right subclavian aneurism, occupying the site of an old abscess. Ligature of the innominate. Cough; râles in chest; paralysis of left side of face; death in forty-eight hours. *Necropsy*.—Acute inflammation of arterial

sheath and around ligature; pleurisy; purulent mediastinitis; œdema of lungs; pneumonia; extravasated blood over both hemispheres. (*Allgemein Kriegs Chirug.*, 1864, p. 459. Poland, xv, p. 78; xvii, p. 137 (Case 110).)

14. COOPER, San Francisco, 1859.—Male patient. Two aneurisms, one at root of subclavian, the other at root of carotid, united by adhesions. Incision, Mott's modified, with removal of summit of sternum and sternal end of clavicle. Innominate dilated by aneurism and ligatured within three-quarters of an inch of the aorta. After five days, restlessness, dyspnoea, retention of urine. Death on ninth day. *Necropsy*.—Pus in right kidney; no mention of condition of aneurism or of seat of ligature. (*American Journal of the Medical Sciences*, N. S., vol. xxxviii, 1859, p. 395. Poland, xv, p. 78; xvii, p. 135 (Case 107).—W. Thomson.)

15. COOPER, San Francisco, 1860 (second case).—Disease not stated; probably aneurism. Upper part of sternum and sternal end of clavicle removed. Ligature of innominate. Hæmorrhages, arrested by compression. Patient removed the bandages and allowed himself to bleed to death on the thirty-fourth day. Hæmorrhage believed to be from distal end. (*San Francisco Medical Press*, January, 1861. *Gaz. Hebdom.*, 1861, p. 612. Poland, xv, p. 78; xvii, p. 135 (Case 108).—W. Thomson; W. G. Spencer.)

16. A. W. SMYTH, 1864.—W. M.; mulatto; aged thirty-three years; steamboat steward; admitted at New Orleans Hospital, May 9, 1864. Aneurism of right subclavian dated from a collision of patient's ship in February, 1864, when he hung from an anchor with another man clinging to him. Small throbbing tumor noticed a month later, which gradually enlarged. Operation, May 15. Mott's incision. Ligature of the innominate quarter of an inch from the bifurcation and of the carotid. Ligature came away from carotid on May 28 and from innominate on June 2. Hæmorrhages on May 29, 30, and 31; lint packing. Wound filled with small shot on June 1. Some shot removed June 17, return of hæmorrhage. Further hæmorrhages, and on July 5 "terrific hæmorrhage," which ceased spontaneously. July 9, ligature of vertebral; all shot removed following day; complete recovery. May, 1869, no vestige of aneurism. June, 1874, aneurism recurred and became larger than at first. October 5, internal mammary tied; some improvement (?). Abscess above clavicle opened March 29, 1875; two days later aneurism ruptured into cavity of abscess; sac laid open and stuffed with lint; mouth of supplying vessel not found. Death, April 6, 1875. *Necropsy*.—(Arteries injected.) Innominate had been tied less than an inch from its origin; fibrous tissue beyond. Carotid occluded to its bifurcation and subclavian to within quarter of an inch of thyroid axis, which, with its branches, was pervious. Vertebral occluded to fourth cervical vertebra. (*American Medical Times*, vol. ix, 1864, p. 95, August 20. *American Journal of the Medical Sciences*, N. S., vol. lii, 1866, p. 280. Sydenham Society's Biennial Retrospect, 1865-6, p. 646. Smyth: Report of the Successful Ligature of the Innominate, the Common Carotid, the Vertebral and the Internal Mammary Arteries, New Orleans, 1876.—W. Thomson. *Dublin Jour. Med. Sci.*, 1876, third series, vol. lxii, p. 482. Poland, xv, p. 78; xvii, p. 141 (Case 111).—Souchon.)

17. LYNCH, New York, 1867.—Gunshot wound of the internal carotid and vertebral arteries. Ligature of the innominate for secondary hæmorrhage, the common carotid having been tied a month previously. Hæmorrhage on twelfth day and the patient died soon after. *Necropsy*.—Partially organized clots in cardiac end of innominate. (*Medical Gazette*, New York, 1868, vol. i, p. 100.—W. Thomson.)

18. E. R. BICKERSTETH, 1868.—J. J.; aged forty years; dock porter; admitted to Liverpool Royal Infirmary, April 15, 1868. Subclavian aneurism size of a hen's egg, attributed to a strain in lifting three weeks previously. Operation, May 5. Mott's incision; specially made lead wire clamp, with screw for tightening, applied round the innominate. On May 7 pulsation returned in the aneurism and the lead wire was found to be broken. Clamp removed and vessel tied with silk above and below where the wire had been. Suppuration. Hæmorrhage from the wound, May 13 and 14. Shot poured into wound. Death, May 14, seventh day after ligature. *Necropsy*.—Clot in aneurism and in innominate from aorta to point of ligature. Hæmorrhage from "the distal side of the upper" ligature. (*Medico-Chirurgical Transactions*, vol. lvi, 1873, p. 129. *Lancet*, London, December 7, 1872, p. 815.)

19. A. B. MOTT, New York, 1868.—Male patient. Subclavian aneurism. Operation, August 13, 1868. Innominate and carotid tied. Ligature came away on twentieth day; hæmorrhages; death on twenty-third day. *Necropsy*.—Hæmothorax; sac ruptured into pleural cavity. (Wyeth: *Trans. Amer. Med. Association*, vol. xxix, 1878, p. 168.—W. G. Spencer.)

20. S. B. PARTRIDGE, 1870.—R. C.; a native hawker; admitted to Medical College Hospital, Calcutta, April 17, 1870. Aneurism of right carotid of one and a half years' duration. Common carotid tied below omohyoid. Ligature separated on May 2, thirteen days after operation; on same day patient feverish and coughing, and at 10 P.M. sudden gush of arterial blood from wound; innominate ligatured just below bifurcation; patient died one and a half hours later. (*Indian Annals of Medical Science*, vol. xiv, p. 222.—W. Thomson.)

21.—E. S. O'GRADY, Dublin, 1873.—Patient, a cabinet-maker; work entailed considerable strain on right shoulder. Large aneurism of three years' duration in axilla and above clavicle. Operation, inner two inches of clavicle removed; carotid and innominate tied. Death in twenty hours. *Necropsy*.—Serous effusion into cerebral ventricles. (Power: *Anatomy of the Arteries*, third edition, by W. Thomson, p. 49.—W. Thomson.)

22. G. BUCHANAN, 1880.—T. W., aged forty years; stone-dresser; admitted to Western Infirmary, Glasgow, April 19, 1880. Tumor right side of neck for four months; large subclavian aneurism with inflamed skin over it. Potassium iodide and morphia given May 14; galvanopuncture. Subsequently, repeated bleedings from needle punctures and great increase in size of tumor, so that it pressed on larynx and trachea. June 1, sharp hæmorrhage and large clot noted, forming a projection covered by thin skin which had given way in two places. Bleeding stopped spontaneously. Operation same day; incision in line of carotid and transversely across tumor; gush of arterial blood stopped by pressure.

Sac had burst before operation; rent found in vessel at bifurcation of innominate; innominate ligatured. Patient died in a few minutes. (*Glasgow Medical Journal*, fourth series, vol. xiv, 1880, p. 152.)

23. W. THOMSON, 1882.—J. M., aged forty-nine years; locksmith; admitted to Richmond Surgical Hospital, Dublin, February 7, 1882. Never had syphilis; fairly temperate; had fought in the American Civil War. Pains in right arm two and a half years; tumor in neck two months; aneurism of second and third parts of subclavian. Left hospital. Readmitted, May 22. Operation, June 9. Mott's incision; innominate tied with flat (ox aorta) ligature, secured with three knots, drawn with moderate firmness. After-progress at first good. Drainage-tube removed on the seventh day, and a few strands of catgut substituted for it. Suppuration; hæmorrhage on thirtieth and thirty-ninth days; death on forty-second day. *Necropsy*.—Drainage-tube sinus had become septic, producing ulceration on anterior face of innominate distal to ligature; from this place hæmorrhage had apparently taken place. Aneurism full of clot; inner coats of innominate not divided, and vessel not occluded, a "chink" remaining; no trace of ligature. (*Brit. Med. Jour.*, 1882, vol. ii, p. 722. *International Encyclopædia of Surgery*, vol. iii, p. 538.—W. Thomson.)

24. W. M. BANKS, 1883.—J. B., aged fifty years; male; admitted to Liverpool Royal Infirmary, February 10, 1883. Aneurism of third part of subclavian. Rest, etc., tried without good effect, and on February 26 innominate and carotid tied through Mott's incision; kangaroo tendon ligatures used, and tied with a force thought sufficient to occlude artery without damaging coats. Pulsation in aneurism returned same evening, and remained. Wound healed and patient went out on twentieth day. Readmitted, and sixty-seven days after first operation first part of subclavian tied with great difficulty, a double catgut ligature being used. Sepsis; bronchopneumonia; hæmorrhage from wound thirty-first and following days; patient died thirty-seventh day. On fourth day, aneurism small, hard, and free from pulsation. *Necropsy*.—Innominate patent. (Jacobson: *Brit. Med. Jour.*, 1885, vol. i, p. 230. *Proc. Royal Medico-Chirurgical Society*, N. S., vol. i, p. 232.—W. G. Spencer.)

25. BULL, New York, 1884.—Subclavian aneurism. Innominate, carotid, and vertebral simultaneously ligatured with double catgut ligatures. Death on thirty-third day from hæmorrhage.—(Burrell.)

26. BENNETT MAY, 1886.—J. N., aged thirty years; brewer's laborer; admitted to Queen's Hospital, Birmingham, March 3, 1886. For years great exertions and violent straining, particularly of right shoulder, which has been dislocated three times. No syphilis. Moderate drinker. Shooting-pains and numbness down the arm for seventeen months; swelling above clavicle nine weeks. Aneurism of subclavian extending under sternomastoid. Rest, Tufnell's diet, and potassium iodide. No improvement, and patient not willing to continue the treatment. Operation, March 27. Innominate tied through Mott's incision; ox aorta ligature broke, so five or six strands of medium-sized catgut used and tied as one ligature, secured with three knots; endeavor made to avoid crushing coats of artery; wound drained. Pulsation returned in aneurism the following

day; hæmorrhage from wound, April 10 and following days; suppuration; death, April 14, eighteen days after the operation. *Necropsy*.—Large aneurism, which had eroded vertebræ, and occupied all three stages of the subclavian artery. Knot of ligature very large and hard, and under it a hole in the artery, from which the hæmorrhage had taken place; inner coats otherwise intact. (*Lancet*, London, 1886, vol. i, p. 1064.)

27. DURANTE, 1887.—G. S.; employé; aged forty-five years; admitted to Durante's Clinique, Rome, March 20, 1887. Tingling and pain in arm for two years. Tumor above clavicle one month. Aneurism between scaleni. Operation, March 25. Ligature of innominate, carotid, and vertebral through Mott's incision. Drainage-tube left in until April 3. Sepsis; right hemiplegia; hæmorrhages commencing April 6; death fifteenth day (April 9). *Necropsy*.—Aneurism collapsed and containing coagula; embolic softening of left caudate nucleus. (W. G. Spencer: *Lancet*, London, April 30, 1887, p. 876. Sajous: *Journal*, 1888, p. 251.—Souchon.)

28. J. LEWTAS, 1889.—Patient, a soldier, aged twenty years, in Murdan Hospital, Punjaub, India. A month before operation his gun burst, and he thought that a piece of the breech lodged above the right collar-bone; bleeding from the wound there for three days before admission. Hard, non-pulsating swelling above clavicle, with brownish blood oozing from partly healed wound in its centre; thought to be an abscess. Operation, May 13. Wound enlarged and fragment of steel removed; profuse hæmorrhage, stopped by pressure; incision along inner margin of sternomastoid; innominate and carotid tied with catgut. Recovery. The operator remarks that, had he known how unfavorable the results of operation were, he would have contented himself with plugging the wound. (*Brit. Med. Jour.*, 1889, vol. ii, p. 312.)

29. G. E. TWYNAM, 1889.—E. P.; female; aged eighteen years; admitted to Prince Alfred Hospital, Sydney, New South Wales, having one month previously (on July 21, 1889) been thrown from a horse, fracturing the right clavicle and bruising the right shoulder. Boggy swelling formed above clavicle, which increased in size; pulsation; much pain. Operation. Central incision and separation of sternolaryngeal muscles; innominate and carotid tied with silk; wound closed without drainage. Following morning, about 9 A.M., patient suddenly became unconscious with left facial paralysis, and died in an hour. *Necropsy*.—Wound only examined. Sac contained coagula and communicated with first part of subclavian by a rounded aperture; inner coat of innominate completely ruptured by ligature; no distal plug of blood-clot in innominate or carotid. Cause of death uncertain, as brain was not examined. Twynam suggests thrombosis of cerebral veins. (*Lancet*, London, 1890, vol. i, p. 1352.)

30. W. H. A. JACOBSON, 1890.—A. H.; gamekeeper; aged forty-eight years; admitted to Guy's Hospital, London, February 10, 1890. Large aneurism in axilla and above clavicle. Swelling noticed a year before. Ligature of the innominate and carotid through Mott's incision, with removal of the inner end of the clavicle; ox aorta used for ligature material, and tied so as to close vessel without injuring coats; drainage-tube inserted. Pulsation ceased in aneurism and never returned. Rest-

lessness, delirium, and bronchopneumonia; died, exhausted, on tenth day after operation. *Necropsy*.—Large aneurism of second and third parts of subclavian, filled with clot; remains of ligature loose, round innominate, but no knot found; drachm of "quite sweet puslike fluid" surrounding bifurcation of innominate; bronchopneumonia of both bases; valvular disease of heart; atheroma of aorta; early nephritis. Brain normal. (Jacobson.)

31. C. COPPINGER, 1893.—Man; aged fifty-three years; admitted to Mater Misericordiæ Hospital, Dublin, December 5, 1892, with aneurism of the second and third parts of the subclavian and aneurismal dilatation of the axillary artery. Operation, January 9, 1893. Ligature of innominate and carotid through Mott's incision; silk used; carotid tied in two places and divided; strict antiseptic precautions. On third day, when dressings were removed, no pulsation in aneurism. Patient shown at meeting of British Medical Association at Newcastle-on-Tyne in August, 1893; good health; strong and useful right arm; no pulse at right wrist; small, hard swelling above clavicle. On July 4, 1895, patient was seen at St. Bartholomew's Hospital, London, and was then quite free from any trace of his aneurism. (Letter from Dr. Alfred Willett to Dr. Coppinger.) (*Lancet*, London, vol. ii, 1893, p. 327. *Trans. Roy. Acad. Med., Ireland*, vol. xi, 1893, p. 243. *New York Medical Journal*, April 8, 1893.—Souchon.)

32. C. J. SYMONDS, 1894.—G. M.; aged fifty-three years; male; admitted to Guy's Hospital, London, October, 1894, with subclavio-axillary aneurism. Operation, November 5, 1894. Attempt first made to ligature first part of the subclavian through a vertical incision over the sternomastoid, but sharp hæmorrhage occurred on attempting to pass the needle round the artery; thought that some branch of thyroid axis was injured. Mesial vertical incision made and the two vertical incisions joined by a transverse one above the clavicle, the sternal head of the sternomastoid being divided; innominate and carotid tied with silk. Two sinuses formed after operation, through which catgut and one piece of silk came away. Patient seen in June, 1895; aneurism hard; usefulness of limb returning; no pulse in radial; pulse in carotid above ligature. In response to an inquiry, Mr. Symonds kindly writes on October 1, 1904, "The man died some time ago of a general malady."—(Jacobson.)

33. H. L. BURRELL, 1895.—R. F.; male; aged fifty-four years; a clerk; patient in Boston City Hospital. "Lump in throat" for eighteen months. Pulsation in vessels of right side of neck with expansive thrill and bruit; undue pulsation in various other arteries; heart systolic and diastolic murmurs. Operation, January 15, 1895. Ether. Mott's incision, with removal of sternoclavicular articulation and adjacent portion of sternum; innominate found much dilated (estimated diameter one and one-quarter inches); ligatured with flat, braided-silk tied in a "square (reef) knot;" knot tied slowly; coats of the vessel felt to give way; second similar ligature placed half an inch distally to the first (first ligature to act as "breakwater"); wound closed without drainage. Primary wound healing; pulsation ceased in aneurism; pulse returned in radial but not in carotid; patient got up on the fifty-ninth and left hospital on

the seventy-third day. Subsequently, œdema of feet and heart trouble. Died suddenly from heart failure on the one hundred and fourth day after operation. *Necropsy*.—Hypertrophied and dilated heart; chronic congestion of lungs, liver, spleen, and kidneys; old pleurisy; ascites; general arteriosclerosis; circumscribed dilatation (fusiform aneurism) of right subclavian, of innominate and of right iliac; innominate had been occluded by distal and severed by promimal ligature, the latter ligature being found inside the artery, the lumen of which had been restored; chronic interstitial orchitis (indicating syphilis).—(Burrell.)

34. B. FARQUHAR CURTIS, 1899.—M. A.; aged fifty-three years; carpenter; admitted to St. Luke's Hospital, New York, November, 1899, with subclavio-axillary aneurism. Symptoms of some months' duration. Rest, limited diet, and potassium iodide improved the condition of the arteries and moderated the heart's action. Ligature of the innominate, December 2, 1899. Median incision; separation of sternolaryngeal muscles; splitting of manubrium sterni in middle line; transverse division of sternum above second rib. Innominate much dilated, but with apparently healthy walls; ligatured with a double heavy chromicized catgut ligature, the two threads being tied simultaneously; internal coats not divided; single similar ligature put round vessel a quarter of an inch distally to the first; wound closed with gauze drainage. Some sepsis and slow wound healing; no hæmorrhage; pulsation returned in the aneurism four days after the operation.

March 13, 1900. Second operation. Carotid and first part of subclavian tied, the clavicle being divided and wired. Innominate impervious; pulsation in sac came from some branch of first part of subclavian. Some sepsis followed, attributed to difficulty in sterilizing rough and wrinkled skin of patient. On October 24, 1900, patient in good health, with no trace of the aneurism. Dr. Curtis kindly writes that "patient was kept under observation for eleven months, when he was well and apparently cured of his aneurism."—(ANNALS OF SURGERY, October, 1901.)

35. C. A. BALLANCE, 1902.—Patient, a royal marine; aged thirty-five years; admitted to St. Thomas's Hospital, London, March 27, 1902. Exposed to syphilitic infection and had gonorrhœa in 1885. Pain in neck and cough for six months; swelling in neck for three months. Treated for a period before admission by rest, reduced food and drink, and large doses of potassium iodide; but swelling continued to increase in size. Large aneurism involving innominate and origins of carotid and subclavian; dulness under right upper part of manubrium. Operation, April 15, 1902. Median incision; separation of sternolaryngeal muscles; manubrium bisected vertically; horizontal division of sternum at level of second costal cartilages; half an inch of bone removed on each side of vertical bone incision; about half an inch of undilated innominate found between aneurism and aorta; vessel tied in a "stay knot" with four strands of No. 4 goldbeaters' skin; carotid also tied. Patient developed left hemiplegia on the afternoon of the day of operation, and died in the evening. *Necropsy*.—Thrombosis of right middle cerebral artery; aneurism of innominate, origin of carotid, and first and second parts of subclavian;

ligature held walls of innominate in contact without rupture of coats. The author thought that the cerebral thrombosis was contributed to by the debilitated condition produced by the Valsalvan treatment. (*Lancet*, London, 1902, vol. ii, November 1, p. 1180.)

CASES OF ATTEMPTED LIGATURE, ETC.

1. W. H. PORTER, Dublin, 1832.—Male; aged forty-seven years; laborer. Very large subclavian aneurism of two and one-half years' duration. Attempt to find a healthy portion of innominate failed; operation abandoned; wound suppurated. Subsequently, pulsation diminished, and finally ceased in tumor. Porter, seven years later, wrote that the tumor had entirely disappeared, and he believed the patient to be alive and well. (*Dublin Journal*, 1832, vol. i, p. 25. Poland, xv, p. 66; xvi, p. 68; xvii, p. 99 (Case 62).)

2. HOFFMAN, New York, 1839. (Case also described by Post.)—Negro; aged sixty-three years. Aneurism of subclavian of five months' duration. Operation, October 26, 1839. Innominate too diseased for application of ligature. Death from exhaustion three months later. *Necropsy*.—Atheroma of aorta and innominate; two aneurismal sacs on subclavian artery. (Catalogue of Pathological Cabinet, New York Hospital Museum, p. 288 (or 258?). (Prep. 630.) Poland, xv, p. 68; xvi, p. 71 (Case 64). Gross: Surgery. *New York Journal of Medicine*, No. 4, p. 370. (Post.))

3. ASTON KEY, 1844.—Married woman; aged forty-six years; admitted to Guy's Hospital, London, April 25, 1844. Aneurism of right subclavian of three months' duration. Attempt to tie innominate failed. Hæmorrhage from wound on seventh day. Sac enlarged, pressing on trachea. Death from dyspnoea, twenty-fifth day. *Necropsy*.—Atheroma of aorta; small aneurism of descending thoracic aorta; aneurisms of innominate and subclavian, vessel remaining of its normal caliber between the scaleni; death apparently from pressure on trachea. (Crisp, p. 206. Poland, xv, p. 66; xvi, p. 70 (Case 63).)

4. ANTONIO JOSÉ PEIXOTO, 1851.—Patient, Dr. J. A. de Moura, a Portuguese; aged thirty-three years. In 1832 developed vascular tumor of right ear, which increased in size. "Bleeder" symptoms. Posterior auricular artery tied by Nélaton in 1845. On November 14, 1851, common carotid tied in Rio Janeiro; hæmorrhage from wound on December 4 and 7; "*ligature d'attente*" passed under innominate on December 8; no further bleeding, so the ligature was withdrawn on December 13, without being tied. Cure complete in two months. (Poland, xvii, pp. 89 and 92. W. Thomson. Koch (Case 129). *Mémoires de l'Académie Impériale de Médecine*, vol. xix, 1855, p. 23. *Amer. Med. Jour.*, January, 1857, vol. xxxiii, p. 255. *British and Foreign Med. Review*, October, 1856, vol. xviii, p. 353.)

5. G. H. PORTER, 1867.—P. G.; aged forty-three years; laborer; admitted to Meath Hospital, Ireland, June 11, 1867. Aneurism of subclavian of fourteen months' duration. June 26, acupressure of axillary continued for fifty-three hours; no permanent improvement. July 31, innominate

CASES OF ATTEMPTED LIGATURE, ETC.

No.	Operator.	Place and Date of Operation.	Sex and Age of Patient.	Disease and its Duration.	Procedure.	Result.
1	W. H. Porter.	Dublin, 1832.	Male, 47.	Subclavian aneurism; 2½ years.	Attempted ligature.	Innominate unhealthy; sepsis; recovery.
2	Hoffman.	New York, 1839.	Male, 63.	Subclavian aneurism; 5 months.	Attempted ligature.	Innominate unhealthy; death 3 months later.
3	Aston Key.	Guy's Hospital, London, 1844.	Female, 46.	Subclavian aneurism; 3 months.	Attempted ligature.	Sac large; hæmorrhage; death, 25th day.
4	Antonio José Peixoto.	Rio Janeiro, December 8, 1851.	Male, 33.	Vascular tumor of ear; 19 years.	Ligature passed but not tied.	Recovery.
5	G. H. Porter.	Meath Hospital, Ireland, July 31, 1867.	Male, 43.	Subclavian aneurism; 14 months.	Clamp used.	Death, 10th day; sepsis; hæmorrhage.
6	T. Annandale.	Royal Infirmary, Edinburgh, May 27, 1885.	Male, 53.	Subclavian aneurism; 13 months.	Clamp used.	Death, 12th day; sepsis; hæmorrhage.
7	Communicated by E. Souchon.	Charity Hospital, New Orleans, 1894.	.....	.....	Attempted ligature.	Innominate unhealthy.

laid bare and compressed between the blades of an instrument something like a lithotrite, one blade being passed under the artery and the other made to slide down on it. Pulsation ceased, but returned next day; instrument screwed tighter, but pulsation only temporarily arrested; removed next day (August 2). Hæmorrhage from wound on August 9 and 10. Death, August 10 (tenth day). *Necropsy*.—Sloughy aperture on anterior surface of innominate just below bifurcation; artery had evidently partly slipped from between blades of compressor, which were too short. (*Dublin Quarterly Jour. of Med. Sciences*, vol. xlv, November, 1867. Poland, xvi, p. 63; xvii, p. 101 (Case 55). *Medical Press and Circular*, Dublin, 1877, pp. 8 and 131.—W. Thomson.)

6. T. ANNANDALE, 1885.—J. B.; male; aged fifty-three years; admitted to Royal Infirmary, Edinburgh, May 14, 1885. Aneurism of second and third parts of subclavian of thirteen months' duration. Had been treated in the Infirmary about a year previously by rest, dieting, and potassium iodide without any effect on aneurism. Aneurism attributed to a strain. No history of syphilis. Operation, May 27. Innominate exposed through a "median cervical incision;" specially designed compressor applied to artery and found to be efficient in stopping the circulation; compressor removed and piece of half-inch india-rubber drainage-tube adjusted, so that one end of it lay behind the artery while the other protruded from the external wound. (The idea was subsequently to use the compressor, slipping its small blade into the drainage-tube.) Wound healed except where drainage-tube was inserted. Hæmorrhage from wound on eleventh and twelfth days; attempt to ligature innominate on latter day failed, so the compressor was applied, stopping the bleeding. Death five hours later. (*Lancet*, London, vol. i, 1886, March 13, p. 481.)

7. E. SOUCHON, 1894.—In a personal letter to Burrell, Souchon speaks of a case in the Charity Hospital, New Orleans, in which the innominate was exposed by removal of part of the sternum, but not ligatured, because it was found so greatly enlarged.—(Burrell.)

6. *Commentary*.—The number of cases in which the innominate has been approached by operation with a view to its obliteration is 43. In 36 of these ligature was accomplished, 28 dying, 8 recovering, a mortality of 78 per cent. Subtracting the cases in which the patients were moribund at the time of operation or died a few minutes after operation, viz., Hutin's (11), Partridge's (20), Buchanan's (22), and probably also Bujalsky's second case (8), 32 cases are left with 24 deaths, a mortality of 75 per cent. Omitting all cases prior to 1871, i.e., prior to the antiseptic period, a total of 16 cases is left (O'Grady's to Sheen's) with 9 deaths, a mortality of 56, 25 per cent. Of the last six cases operated on, five recovered.

Fatal Cases. (1) *Sepsis and Hæmorrhage*.—Thirteen out of the 24 deaths were certainly due to suppuration in the wound causing secondary hæmorrhage. (Cases 1, 2, 6, 12, 15, 17, 18, 19, 23, 25, 26, 27). Two other cases died of hæmorrhage; in one (Hutin, 11) there was direct injury to the artery; in the other (Dupuytren, 9) the cause is not stated. Hæmorrhage commenced as early as the third day (9) and as late as the thirtieth day (23) after the operation. Hæmorrhage having supervened, death usually occurred in from a few hours to three or four days. In Gore's case (12) the hæmorrhage was so furious that death resulted within an hour of its appearance, while in Thomson's case (23) life was prolonged to 12, and in V. Mott's case (1) to 17 days after the appearance of the hæmorrhage. In some cases hæmorrhage commenced at the time of extrusion of the ligature, in others not until some days afterwards. Death occurred as early as the third day (Dupuytren, 9) and as late as the sixty-seventh day (Graefe, 2) after the operation. The latter case teaches us that the risk of hæmorrhage does not cease for a long time, and is present at least as long as there is any discharge from the wound. In two cases (Thomson, 23; Durante, 27), probably in others, sepsis and hæmorrhage were contributed to by the use of a drainage-tube. Bennett May attributes the hæmorrhage in his case (26) to the large hard knot eroding the artery. Hall's (5) is an isolated case. In Jacobson's case (30) the "drachm of sweet pus-like fluid" round the innominate bifurcation suggests the possibility of sepsis and hæmorrhage had the patient survived. In almost all these cases there was an ulcerative arteritis at the site of ligature leading to perforation. In one or two the perforation seems to have been produced adjacent to the deep end of a drainage-tube.

(2) *Sepsis*.—This alone caused death in three cases. (Arendt, 4; Bujalsky, 7; Pirogoff, 13). In all besides the local inflammation there was apparently a condition of acute septic intoxication, and death occurred early, in from two to eight days.

(3) *Cerebral Lesions*.—Three deaths were due to this

cause, the exact lesions being various. (O'Grady, 21; Twynam, 29; Ballance, 35.) In several other cases cerebral symptoms were present, and in two (Pirogoff, 13; Durante, 27) cerebral lesions were found after death.

(4) *Other Causes of Death.*—There remain only three cases to put under this heading: Norman's (3), acute pericarditis; Cooper's first case (14), pus in right kidney, both scantily recorded, and Jacobson's case, bronchopneumonia and acute mental disturbance resembling delirium tremens.

Cases of Recovery.—These are eight in number. Only one (Smyth's, 16) belongs to the preantiseptic period, being the only case which survived the great danger of secondary hæmorrhage. Smyth's and Banks's (24) cases both died of conditions connected with the aneurism, the former 11 years and the latter 104 days after the ligature of the innominate. Burrell's case (33) never completely recovered, and died on the 104th day of general arterial and visceral disease. Symonds's case died of causes unconnected with the aneurism. The cases of Lewtas (28), Coppinger (31), Curtis (34), and Sheen (36) were alive and well when last heard of. Coppinger's case is known to have survived the operation two years, Curtis's 11 months, and Sheen's 8½ months. Omitting Burrell's case, in four of the remaining seven secondary ligaturing operations were required. In only three did the one operation bring about permanent consolidation in the aneurism, the innominate and carotid being simultaneously ligatured in each of the three.

Cases in which the Innominate was cut down upon but not ligatured.—These require little comment. A clamp may slip, may injure the artery, and, by necessitating an open wound, is likely to bring about infection. The spontaneous recovery in W. H. Porter's case (1) after suppuration is interesting.

Asepsis.—To induce and maintain asepsis is imperative in ligature of the innominate. This should be easy under modern conditions, but one or two special precautions are necessary. The preparation of the patient's skin should be com-

menced at least two days before the operation, or even longer when the skin is rough and wrinkled (*cf.* Curtis's case), the superficial epithelium being removed by hot boracic fomentations. The anæsthetist should be screened off by a sterile linen sheet after the plan so successful in Kocher's hands in cases of goitre.* The sterilized cloths should be stitched to the skin close round the wound to prevent their displacement. A drainage-tube should not be used.

Cerebral Lesions.—At the present time, asepsis being attainable, a study of the cases shows that a fatal result is most to be feared from cerebral complications. To lessen this possibility, I suggest that the operation should be performed in two stages, the carotid being tied about a fortnight before the innominate. The central incision could be used for both operations.

General and Local Conditions as Factors determining Success.—Marked general arterial disease with accompanying visceral changes is unfavorable; a circumscribed aneurism with good general condition is favorable. Burrell's (33), although in the list of successes, is a typically unfavorable case: the aneurism was less an aneurism than part of a general arterial dilatation, and all the viscera were extensively diseased. In this case the ligature of the innominate being aseptically conducted did not do any harm, but it probably did little good. The innominate at the point of ligature was one and a quarter inches in diameter, or about the diameter of the normal aorta at its origin; whereas, the normal diameter of the innominate is just over half an inch. The ligature then was really put round the aneurism, if one can apply the term aneurism to a general dilatation of the innominate and subclavian. If circumscribed, the actual size of the aneurism does not matter, as shown by Ballance's case, where the sac reached to within half an inch of the aorta.

Ligature on Failure of Lesser Operative Measures.—

* Kocher's "Text-Book of Operative Surgery," translated by H. J. Stiles, 1903, p. 26. Publishers, A. & C. Black, London.

Given asepsis and a circumscribed aneurism with healthy vessel adjacent, there is no reason against ligaturing close up to the aneurism. This, besides with subclavian aneurism being probably the less serious operation, has the advantages of not interfering with the cerebral circulation and of not giving so great opportunities for the collateral circulation to restore pulsation in the sac. Probably in my own case ligature of the second part of the subclavian would have been sufficient to cure the patient, although the aneurism undoubtedly became smaller and harder as a result of the first operation. The usual surgical opinion that ligature of the first part of the subclavian is unjustifiable requires revision: the fatal cases have all been fatal from sepsis and hæmorrhage. Recently, Nassau, of St. Joseph's Hospital, Philadelphia, has successfully done the operation on the right,* and Stonham, of Westminster Hospital, on the left side.† Curtis's case (34) is a further example of successful ligature of the first part of the right subclavian.

Mode of Approach.—The central incision is the best. That it is applicable to large aneurisms is shown by Ballance's case. Where circumstances necessitate the opening of the anterior mediastinum, this should be done by longitudinal and transverse division of the manubrium sterni, as fully described by Curtis in his account of his case. Removal of bone is rarely necessary. A powerfully bladed double retractor with screw action, having its handles curved down over the chest, suggests itself as the best instrument for forcing the two halves of the bone apart. The operator works standing on the left side of the patient, near the patient's left shoulder, and looks downward into the wound.

Material of Ligature.—The ligature material must be certainly sterile and sufficiently strong to withstand the strain to which it is to be subjected. Too much importance has been

* Gould's "Year-Book of Medicine and Surgery," 1904; Surgery, p. 231.

† Lancet, London, August 2, 1902.

attached to the question of the best material for ligature, fatal results having been attributed by operators to defects in the ligature when they have really been due to septic infection at the site of ligature. Silk, as being strong and certainly sterilizable, is the best material. Whether floss-silk or Chinese twist does not matter.

Degree of Tightness of Ligature. Question of injuring Inner Coats.—Injury to the inner coats becomes a dangerous factor only when in addition to such injury sepsis is present. Even with a diseased innominate, as Burrell's case shows, the inner coat may safely be ruptured. Further, a study of the cases leads one to the conclusion that if the ligature is drawn tight, dividing, to some extent at all events, the inner coats, there is much less probability of pulsation returning in the aneurism. In the accounts of older cases (where one's general knowledge of the material and methods employed leads to the conclusion that in each a silk ligature was used drawn quite tightly) no mention is to be found of return of pulsation in the aneurismal sac, except in one (Lizars), and there it was quite transitory, and the reports of the necropsies indicate consolidation in the sac. In the later cases, on the contrary, where occlusion without rupture of coats was usually aimed at, return of pulsation has been frequent (Banks, Bennett May, Curtis, Sheen), necessitating secondary operations; and, further, the return of pulsation has been early, indicating that it has been due to a direct current of blood through the innominate at the site of ligature rather than to the establishment of a collateral circulation. In Thomson's case, where the innominate was tied with "moderate firmness," a "chink" in the vessel at the site of ligature was found at the necropsy. The experimental work of W. G. Spencer, Deléphine, and Dent * also supports the policy of tight ligature with division of the internal coats. If, however, the operator decides to aim at occlusion without rupture, two or more ligatures lying

* Deléphine and Dent. *Medico-Chirurgical Transactions*, London, vol. lxxiv, 1891, p. 367.

side by side, and thus occluding the arterial lumen over a certain length (Ballance and Edmunds's method), are obviously better for this purpose than a single ligature.

Kind of Knot.—The first turn of either a reef or a surgical knot is liable to slip before the second turn is applied. In the "stay knot" of Ballance and Edmunds, two or more ligatures are placed side by side, round the vessel; in each is made in the same direction the first turn of a reef knot, then on each side the ends are gathered up together and treated as one strand in making the second turn. This knot is much less liable to slip than the others mentioned, but slipping to some extent is possible, particularly when only two strands are used, the "mutual support by friction and interlocking" not being sufficient to prevent such slipping. The stay knot, in my own case, either slipped, or else—a possibility, I think, unlikely from the force used—was not, in making the first turn, drawn sufficiently tight to close the vessel.

With all these knots the slipping of the first hitch is probably to a large extent brought about by the force of the blood pumped from the aorta. Some "breakwater" method, as Burrell terms it, is best to obviate this. Two strands are passed beneath the vessel if possible, half an inch or more apart. The first turn of a surgical or reef knot is then made in the proximal ligature and tightened, pulsation ceasing in the vessel beyond the tightened turn and in the aneurism. This first turn in the proximal ligature is then held tight, and the force of the pumping blood being thus taken off the part of the vessel encircled by the distal ligature, the latter ligature is completely tied by a surgical or reef knot. Finally, the second turn is taken in the proximal ligature and fixes it. This is a modification of Senn's method, which consists simply in placing two ligatures round the vessel and tying the one on the cardiac side first. Such a method was used in Burrell's and Curtis's cases and in my own for tying the subclavian. That this method is not always successful is shown by the return of pulsation in Curtis's case. The ligature on the cardiac side is liable to slip. Hence the modification that I have suggested.

An objection to this modification (not, I think, a great one) is that some part of the procedure has to be intrusted to an assistant. Any method involving two separate ligatures may be inapplicable owing to operative difficulties. I would put in order of preference the methods suitable for occlusion of the innominate after it has been exposed, as follows:

- (a) Two separate ligatures tied as described above.
- (b) The "stay knot," at least three strands being used.
- (c) A single ligature tied in a surgical knot.

In all three cases I would draw the ligature so tightly that some amount of damage to the inner coats would be inflicted, this being particularly essential in the last method.

7. CONCLUSIONS.

1. That in properly selected cases ligature of the innominate is a reasonably safe and undoubtedly useful operation.

2. That suitable cases are those in which the aneurism is of a circumscribed, globular character, and the general condition of the patient is otherwise good. That unsuitable cases are those in which the aneurism is what is commonly called fusiform, but is really often nothing more than part of a general arterial dilatation, and in which there are marked signs of general arteriosclerosis with accompanying visceral disease.

3. That the maintenance of asepsis is the main factor in obtaining a successful result.

4. That the incision should be central with horizontal and vertical division of the manubrium, if necessary.

5. That the carotid should be tied as well as the innominate.

6. That silk is the best ligature material.

7. That some amount of injury to the inner coats is probably necessary to insure occlusion, but that with aseptic conditions such injury does not matter.

8. That two ligatures should if possible be placed round

the vessel, the first turn of the proximal ligature being held tight, so as to keep back the blood while the distal ligature is completely tied.

9. That the use of a drainage-tube is inadvisable.

10. That as a study of the recorded cases shows that, next to sepsis, some cerebral lesion has been the most frequent cause of death after operation, it would be well for future operators to consider the advisability of tying the carotid about a fortnight before the innominate.

11. That "Valsalvan" methods of treatment immediately prior to operation are inadvisable.

8. GENERAL REFERENCES.

N. B.—The words in brackets after certain references indicate the shortened form in which such references are given above in the special references after each case.

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 All the above authorities give lists or collections of cases.

THYROIDECTOMY FOR EXOPHTHALMIC GOITRE.

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THIS mode of treatment is based upon the following facts:

I. That "the whole story of Basedow's disease lies in the thyroid gland." (Kümmell.)

II. That "chemically it makes no difference whether the secretion of the gland is increased or is chemically altered as the result of changes in the blood, in the alimentary canal, or in the central nervous system, the fact remains that the removal of the growing gland does away with the symptoms, and upon the failure to remove the diseased glands depends the failures to cure." (Schulz.)

III. That "the characteristic pathological change in the gland is a diffuse parenchymatous hypertrophy. Where goitre is endemic, this condition is engrafted upon it." (Hamig.)

IV. That "the secretion of the gland in the diffuse parenchymatous hypertrophy is increased in quantity, and is altered in quality." (Hamig, Edwards.)

V. That the complete removal of the gland rarely fails to show signs of degeneration in the central nervous system, the acute form of which is tetany, the chronic form, cachexia thyreopriva.

In several hundred cases, the ultimate results of the removal of the diseased portion of the gland have been more or less imperfectly observed. In about 125 cases, this observation has been very carefully made at periods varying from six months to twelve years. These cases have been reported by Rehn, Riedel, Mikulicz, Krönlein, Kappeler, Wolff, Kocher, Schulz, and Curtis and Booth.

The Mayos have recently reported 34 cases, but with no details.

In all cases reported in detail, where sufficient gland has been removed, the pulse-rate has fallen within 48 hours to 80 and 100 beats per minute. The unrest, the fear, the muscular tremor, and the melancholia have been relieved within the first week.

The exophthalmos has been the most difficult to relieve, and has often persisted two years before complete disappearance. I have seen some cases with a slight degree of it after five years.

A return of the symptoms, including the exophthalmos, after partial thyroidectomy has been reported by Mikulicz (3), and Schulz (2) in five cases. In one of these cases a parenchymatous nodule was only removed. In four cases a resection of one lobe was made. In all a second operation was performed, and a large part of the remaining lobe was removed. In Mikulicz's cases no record exists of the simultaneous recurrence of symptoms and the hypertrophy of the remaining lobe.

In one of Schulz's cases, a recurrence of all the symptoms accompanied an increase in size of the middle and opposite lateral lobe. In this case a second operation was performed, and the remaining lateral lobe was removed almost completely. The symptoms diminished immediately. The pulse fell to 90, and the exophthalmos and the nervousness disappeared rapidly. These cases seem to substantiate the fact that the removal of the diseased and growing gland, or at least the removal of a part, and the production of an atrophy of the portion remaining, is necessary to insure complete success.

Two conditions which take place during or just after operation have been of especial interest, namely, tetany and sudden death. Fortunately, these are not common. In one of Schulz's cases tetany occurred upon the fifth day, and was characterized by spasmodic contracture of the muscles of the calf and of the forearm, dysphagia, laryngospasm, and intense respiratory disturbance. The case was a fatal one from sudden syncope. This condition has not occurred in my cases. Sudden death has taken

place in one of my cases during anæsthesia, and at a time when least expected, since the operation was not a difficult one, nor had there been any untoward symptoms from the anæsthesia. Unfortunately, no autopsy was permitted. These sudden deaths have usually occurred under two conditions. In the one, thymic hypertrophy has been present with thyroid enlargement. In the other, no such thymic hypertrophy exists, although the death is equally sudden.

Marié finds that the thymus is always enlarged in congenital myxœdema, often in myxœdema occurring later in life, and sometimes in acromegalia. He has recorded five instances in which it was present in Basedow's disease. (Lanz.)

Mixed forms of myxœdema, acromegalia, cachexia thyreopriva, Basedow's disease, and the lymphatic-chlorotic constitution (*Status thymicus Paltauf*) are considered as pointing to a single definite lesion, with varieties more or less definitely known by these names. (Marié.) One of these varieties is the persistence of the thymus gland and the coexistence of the hypertrophied thyroid of Basedow's disease. The operation of thyroidectomy, indeed any operation upon the neck under these conditions, is dangerous because of the danger of syncope from diminished resistance, the result of the dyscrasia. This form of death has occurred six times in 319 cases, *i.e.*, 1.8 per cent.

So many cases of sudden death have occurred without the objective symptoms belonging to the lymphatic-chlorotic diathesis, and at the same time without the thymic hypertrophy, that we must believe that the resistance of the individual in Basedow's disease is greatly lowered from other causes than the dyscrasia. From a purely clinical stand-point, it seems probable that these sudden deaths are due to over-excitation and exhaustion of the nerve centres (heart and respiratory), induced, it may be, by an auto-intoxication from the hypertrophied thyroid gland. The death in my case was probably of this nature.

Medicinal treatment should precede surgical interference because of the undoubted cures which have taken place. This

treatment may be combined with the use of the X-ray (Mayo), or with the administration of milk or serum from thyroidectomied goats, sheep, etc. (Lanz and Moebius.) This method of treatment should not be continued too long, unless operative treatment is absolutely contraindicated, since the disease itself tends to diminish the vital resistance and to exhaust the nerve centres. It has been my experience that the earlier the diagnosis and the operation the easier the operation, and the less dangerous and difficult the after-treatment. I have found that in the severer types great benefit is derived from medicinal treatment, combined with rest in bed for two to three weeks previous to operation. The nervous excitation, the tachycardia, and the muscular tremor are so much improved that operation is often undertaken under much more favorable conditions. In the acutely progressing types of this disease, some have proposed an immediate operation because of their resemblance to acute intoxications. The advisability of such a procedure I am unable to substantiate, since it has never been my privilege to meet these types.

Early operation is, however, indicated in all cases as soon as medicinal treatment fails. The operation should not be reserved for the severer cases. The earlier the operation the better the condition of the patient to withstand the ordeal, and the less distressing the after-treatment.

The early operation is especially indicated where Basedow's disease is engrafted upon a colloid goitre.

All of my cases have been operated upon with ether or gas and ether. This has been preceded in some cases by atropia sulphate, $\frac{1}{100}$ grain, and in others by morphia, $\frac{1}{4}$ grain. The cases which demand local anæsthesia and in which general anæsthesia is contraindicated, I have not seen as yet. An experienced anæsthetist is absolutely necessary, and a very small amount of the anæsthetic is to be used.

The extirpation of the greater part of the growing gland is made in all cases. Usually, one lobe and the isthmus are quite sufficient, but when the hypertrophy is vascular and bilateral, I think the symptoms have been best relieved when

one lobe, the isthmus, and a part of the opposite lobe are removed. In some instances the superior or the inferior thyroid artery of the opposite lobe has been tied in addition to the unilateral thyroidectomy. This was done to produce atrophy in the remaining lobe.

The method employed has been practically that of Kocher.

CASE I.—Female, 20, 1897, xii, 10; 1898, i, 10. *Previous History*, negative. *Present History*.—Immediately after childbirth, two years ago, neck began to swell; three months ago, palpitation.

Examination.—Anæmic. Exophthalmos. Graefe's symptom. Pulse, 134. Moebius and Stellwag's symptoms abnormally strong. Pulsation felt in vessels of neck. Both lateral lobes are enlarged. Right lateral and middle lobes give the bulk of the mass.

Operation, 1897, xii, 15. Gas, ether, morphia. Right lateral lobe and isthmus and middle lobe removed.

Immediate Result.—Temperature below 100. Nervousness and heart action better. Pulse, 90. Healing without reaction. No acute thyroidism.

Present Result.—Seven years after operation. Best of health. Exophthalmos and tachycardia have disappeared. Pulse, 75 to 80.

Pathological Examination.—Colloid struma.

CASE II.—Female, 18, 1897, v, 10; vii, 3. *Previous History*, negative. *Present History*.—One year ago at menstruation nervousness and tremor followed within two months by enlargement of the right side of the neck. Exophthalmos and palpitation.

Examination.—Cachectic. Right lateral hypertrophy of thyroid; pulsates strongly on pressure. Palpitation, 130 to 140. Graefe and Moebius symptoms. Exophthalmos.

Operation, 1897, v, 12. Gas and ether. Extirpation of the right lateral lobe and isthmus. Ligature of left superior thyroid.

Immediate Result.—Reactionless course. Four days after operation, pulse, 90; less nervous, less tremor, no palpitation.

Present Result.—Seven years and five months after operation, continued improvement. Exophthalmos gone.

Pathological Examination.—Right lateral lobe and isthmus show colloid struma.

CASE III.—Female, 17, 1898, v, 30; vii, 1. *Previous History*, negative. *Present History.*—Eight months ago neck began to enlarge. Prominence of the eyes; palpitation and nervousness have increased steadily in spite of medicinal treatment.

Examination.—Anæmic. Headaches, unrest. Tremor of the hand. Pulse varies between 110 and 160. Graefe's and Moebius's symptoms are present. Exophthalmos well marked. Left and right lateral lobes are enlarged, the right especially. The swelling is soft and pulsates strongly.

Operation, vi, 5. Gas and ether, morphia. Removal of the right lobe and part of the left lobe.

Immediate Result.—Reactionless healing. Two days after operation, temperature was 100°, 101° F.; pulse, 100 to 120. Palpitation and nervousness are less. Sleeps well.

Present Result.—Six years and seven months after operation. Pulse, 70 to 80. Exophthalmos scarcely observable. Does her work without difficulty.

Pathological Examination.—Parenchymatous goitre.

CASE IV.—Female, 26, 1899, iii, 12; iv, 20. *Previous History*, negative. *Present History.*—About five years ago noticed an enlargement of the neck, with exophthalmos, palpitation, and nervousness. Four years ago, while in the country for three months, all nervousness disappeared, and she suffered alone from palpitation, with pulse frequency of 90 to 110. This continued for one year, when all symptoms returned. Medicinal treatment has failed to give relief.

Examination.—Exophthalmos. Graefe's and Stellwag's symptoms. Slight difficulty in swallowing. Pulse, 120 to 110. Heart sounds are good. Slight tremor of the hands. Excessive nervousness. The left lateral lobe is greatly enlarged. The right is not palpable.

Operation, iii, 14, 1899. Gas and ether. Removal of the left lobe. The right not touched.

Immediate Result.—Reactionless course. Pulse fell to 90 on second day. Less nervous and anxious.

Present Result.—Five years and nine months from the operation. Exophthalmos gone. Nervousness and tremor have disappeared. In good health and strength.

Pathological Examination.—Parenchymatous goitre.

CASE V.—Female, 39, 1901, ii, 15; iii, 5. *Previous History*, negative. *Present History.*—Seventeen years ago a small swelling appeared upon the left side of the neck. It remained so until eight years ago. It has steadily grown during the last three years. Nervousness, palpitation at times. Difficulty in swallowing.

Examination.—On the left side the thyroid is enlarged. Slight exophthalmos. Some muscular tremor in hands. Palpitation upon slight exertion; heart jumping from 80 or 90 to 160 per minute.

Operation.—Removal of the left lobe, isthmus, and middle lobe.

Immediate Result.—Temperature fell from 101° F. on day after to 99° F. on the third day after operation. Pulse remains at 90; nervousness and tremor disappearing.

Present Result.—Three years and ten months after operation. No exophthalmos, no restlessness, no palpitation on exertion. Best of health.

Pathological Examination.—Left lateral lobe presents a firm tissue with several cysts. Alveoli are slightly distended with colloid material. The stroma is infiltrated with a thin albuminous substance, probably colloidal. There is an increase of fibrous tissue in the stroma.

CASE VI.—Male, 31, 1901, iv, 25; v, 23. *Previous History*, negative. *Present History.*—One year ago neck enlarged. Eyes began to be prominent eleven months ago. Became nervous, with palpitation of heart on slight exertion. Difficulty in swallowing.

Examination.—Marked exophthalmos. Tachycardia. Pulse, 120; respiration, 28; temperature, 99° F. Tremor of hands. Great nervousness. Compression of the trachea and œsophagus by the growth. Bilateral thyroidal enlargement, with substernal prolongation.

Operation, iv, 28. Gas and ether. Removal of both lobes was necessitated because of the substernal character of the growth and the collapse of the patient during the operation.

Immediate Result.—Great restlessness. Excessive irritability. Temperature rose to 106° and 104.6° F. following in the twenty-four hours to 99° and 100° F. Pulse, 172, 160, 140,

108. Respirations, 42, 28, 32. This condition continued for three days, when it gradually abated. "Acute thyroidism."

Present Result.—Three years and eight months from operation. Tachycardia and restlessness gone. Pulse has not been felt above 90, even during his work as a peddler. Exophthalmos still noticeable. Lids close easily and there is no stare.

Pathological Examination.—Enlargement of the lobes is uniform. Medium-sized alveoli distended with colloid material; stroma is normal. Right lobe 9 centimetres, 4 centimetres, 3 centimetres. Left lobe $8\frac{1}{4}$ centimetres, 4 centimetres, 3 centimetres. Isthmus $4\frac{1}{2}$ centimetres, 5 centimetres, $2\frac{1}{2}$ centimetres.

CASE VII.—Female, 34, 1901, iv, 19; v, 3. *Previous History*, negative. *Present History.*—Began five years ago upon the right side of neck. One year ago the eyes began to bulge. Five months ago, tachycardia; pulse-rate greatly increased; has become very nervous. Temperature, 100° F.; pulse, 124.

Examination.—Marked exophthalmos; tachycardia; nervousness. Right thyroid lobe is enlarged; heart, lungs, and kidneys are normal.

Operation, iv, 20. Gas and ether; morphia. Removal of the right lateral lobe.

Immediate Result.—Temperature ran between 99° and 103° F. for three days. Pulse from 155 to 80. During this time she was very restless and frightened. These symptoms gradually abated. The restlessness disappeared entirely as the temperature and pulse returned to the normal.

Present Result.—Three years and eight months after operation. Nervousness and tachycardia gone. Exophthalmos scarcely noticeable. Pulse-rate normal. Works daily without fatigue.

Pathological Examination.—Right lobe and isthmus are greatly enlarged, due to hypertrophy of the gland tissue, with increase in the colloid material. "Adenomatous goitre."

CASE VIII.—Male, 39, 1901, iv, 23; v, 11.—*Previous History*, negative. *Present History.*—One year ago right side of neck enlarged; at present it is markedly enlarged. Four months ago the eyes became prominent. Nervousness has recently occurred. Palpitation on slight exertion.

Examination.—Moderate exophthalmos. Tachycardia.

Pulse, 130; temperature, 99° F.; respiration, 30. Excessive nervousness. An enlarged right lobe of the thyroid.

Operation, iv, 25. Gas and ether. Removal of the right lobe and of the isthmus.

Immediate Result.—Temperature, 103° F.; pulse, 132; respiration, 28. Nervousness. Restlessness and tremor of hands. These symptoms continued for three days, when the temperature and pulse returned to the normal. The tachycardia and restlessness now disappeared.

Present Result.—Three years and eight months from the operation. Tachycardia. Nervousness and exophthalmos have entirely disappeared. Works daily as a tailor.

Pathological Examination.—Adenomatous enlargement of the isthmus and right lobe of the thyroid gland.

CASE IX.—Female, 23, 1902, iii, 11; iii, 13. *Previous History*, negative. *Present History*.—Began four years ago. Nervous, palpitation and general tremor began two years ago. Dysphagia. Temperature, 100° F.; pulse, 134, irregular; respiration, 28. Otherwise normal.

Examination.—Marked exophthalmos. General tremor. Tachycardia, 116 to 124. Nervous. Lungs and kidneys normal. Bilateral thyroid enlargement, soft and vascular variety.

Operation.—Gas and ether. During extirpation of the left lobe, the patient suddenly became cyanotic. Respiration and pulse stopped at the same time. No efforts at resuscitation availed. Two and one-half ounces of ether had been administered. This condition happened suddenly and unexpectedly. There was no thymic hypertrophy found at this time.

Immediate Result, death.

Pathological Examination.—No autopsy was permitted. Simple vascular adenomatous enlargement of the left thyroid lobe.

CASE X.—Female, 30, 1902, iii, 25; iv, 23. *Previous History*, negative. *Present History*.—Five years ago nervous exhaustion with some exophthalmos and palpitation as symptoms. Four years ago exophthalmos began to diminish. Four years ago swelling in the neck was first noticed. An improvement took place three years ago, and continued until one year ago, when all the symptoms returned with greater intensity.

Examination.—A diffuse bilateral thyroid enlargement.

Marked exophthalmos. Tachycardia. Pulse, 120 to 130. Nervous. Tremor of hands. Graefe's and Stellwag's symptoms. Lungs and kidneys normal.

Operation, iv, 2. Gas, ether, and morphia. Removal of both lobes, leaving an enlarged middle and a small part of one lateral lobe so as to preserve the superior thyroid artery and vein for its nutrition.

Immediate Result.—Restlessness and tremor began to diminish on the second day. On the same day, pulse, 90; temperature, 100° F. On fourth day, pulse, 80; temperature, 99° F.

Present Result.—Two years and nine months after operation. Exophthalmos almost gone. Tachycardia and nervousness disappeared. Walks long distances without heart palpitation. Tremor gone. Health perfect.

Pathological Examination.—Bilateral adenomatous thyroid enlargement; very vascular.

CASE XI.—Female, 27, 1902, viii, 7; ix, 7. *Previous History*, negative. *Present History*.—Five years ago. Palpitation, nervousness and tremor began. Four years ago, exophthalmos. Neck began to swell four years ago. These symptoms have increased steadily, with frequent intermissions.

Examination.—Bilateral enlargement of the thyroid gland; soft to pressure. Pupils dilated. Marked exophthalmos. Nervousness. Heart overacting and sounds heard all over the chest. Pulse, 104 to 120. Temperature, 99° F. Lungs and kidneys normal. Graefe's and Moebius's symptoms present.

Operation, x, 6. Gas and ether, preceded by atrophina sulphate, $\frac{1}{100}$; changed to chloroform. One and three-fourths lobes removed. The upper quarter of one lobe was preserved with its circulation intact.

Immediate Result.—For seven days, temperature remained between 99 and 102° F.; pulse between 120 and 80; respirations between 20 and 24. The nervousness and the tachycardia gradually diminished. The tremor less rapidly. The exophthalmos not at all.

Present Result.—Two years and two months after operation is in the best of health. Slight exophthalmos, but all else has disappeared. It is noticeable in the history that seven months after operation this patient seemed to present some signs of cachexia thyreopriva in that she became listless, even stupid at

times, with short and brittle hair and a dry and scaly skin. She looked very old. These symptoms disappeared within the following six months.

Pathological Examination.—On section, the lobes show a uniform structure. No cysts, no abnormal amount of colloid material. It shows a typical structure of a parenchymatous goitre. There is newly-formed gland tissue in the form of small alveoli. The follicles contain but little colloid material. The stroma is moderate in amount and fibrous in structure. In many places it is infiltrated with small round cells.

CASE XII.—Male, 45, 1904, x, 11; xi, 4. *Previous History*, negative. *Present History.*—One year ago lost health and became very nervous, with headaches and pain in the stomach. Was treated for gastric disturbance. Six months ago slight exophthalmos and tachycardia began. The left side of neck began to enlarge.

Examination.—Exophthalmos, tachycardia, nervousness. Slight tremor in hands. Hyperidrosis. Left lateral thyroid enlargement.

Operation, x, 12. Gas and ether, morphia. Left lobe and part of the right removed.

Immediate Result.—Temperature and pulse were practically normal after operation. Nervousness and palpitation diminished. Complains of severe pain in the stomach as formerly. Exophthalmos less in the right than in the left eye. No stare.

Present Result.—Three months after operation. Good health; has gained fifteen pounds. Nervousness and exophthalmos have diminished. Nervousness almost entirely. The exophthalmos more so in the right than in the left, but some is still present. Pulse, 80. No palpitation on exertion.

Pathological Examination.—A pure parenchymatous goitre.

CASE XIII.—Male, 17, 1904, xi, 1, 16. *Previous History*, always well. *Present History.*—Three years ago, palpitation of heart began, nervousness and trembling of hands. Later the eyes became prominent. Pulse, 70 to 120. Neck has enlarged greatly within the last year.

Examination.—Bilateral thyroid enlargement; soft, vascular, and uniform. Exophthalmos. Graefe's and Stellwag's symptoms present. Tachycardia; pulse-rate varies between 70 to 120; slight muscular tremor in hands. Nervousness and hyperidrosis.

Operation, xi, 2. Gas and ether, morphia. Removal of the right lobe, isthmus, and middle lobes. Ligature of the superior thyroid artery and vein of the left side.

Immediate Result.—Temperature ranged for five days between 104° and 99° F.; pulse, 130 to 90. Slight bronchopneumonia. Nervousness. Tremor was marked during this time. This condition was looked upon as a slight degree of acute thyroidism, although there was present evidences of a slight bronchopneumonia. After five days these symptoms all abated rapidly, and the patient left the hospital on the fourteenth day after operation completely healed.

Present Result.—Two months after operation. Best of health, with freedom from feeling of unrest, palpitation on exertion. Is working daily at his trade. The exophthalmos has greatly diminished, though it is still present. The "stare" is gone, and the ability to close the lids in all positions of the eye is perfect.

Pathological Examination.—Right lobe equals 11 centimetres, 5 centimetres, 4 centimetres; middle lobe equals 6 centimetres, 4 centimetres, 2 centimetres. There is a moderate enlargement of the alveoli, which are filled with colloid material. Some alveoli contain a moderate amount of blood pigment. The stroma is very vascular. In parts newly formed, gland tissue is seen in the form of small alveoli with but little colloid matter, and here the stroma is infiltrated with small round cells. Colloid parenchymatous goitre.

CASE XIV.—Female, 26, single, 1905, iii, 23; 1905, iv, 6. *Previous History*, negative. *Present History*.—Exophthalmos and tachycardia. Became very hysterical; condition gradually increased with remissions. Swelling in neck began six years ago.

Examination.—Diffuse bilateral thyroid enlargement. Circumference of neck, 33 centimetres. Exophthalmos. Tachycardia, 90 to 120. Graefe's and Stellwag's symptoms. Lungs and kidneys normal.

Operation.—Gas, ether, and morphia. Hæmithyroidectomy with ligature of superior thyroid artery and vein of remaining lobe.

Immediate Result.—No temperature. Diminution of restlessness.

Present Result.—Three months after operation exophthalmos

rapidly diminishing. Tachycardia and nervousness gone. Health perfect.

Pathological Examination.—Vascular adenomatous thyroid.

CASE XV.—Female, 25, single, 1905, v, 8; 1905, v, 20. *Previous History*, negative. *Present History.*—Six years ago prominence of eyes and nervousness with tumor of hands began. Has continued. Two years ago several patches of scleroderma and alopecia areata appeared. Has been treated in vain by medication.

Examination.—Diffuse bilateral thyroid enlargement. Circumference of neck, 34.37 centimetres. Tachycardia, 90 to 120. Graefe's and Stellwag's symptoms. Exophthalmos. Very nervous. Kidneys and lungs normal.

Operation.—Hæmithyroidectomy with ligature of the superior thyroid artery and vein of opposite lobe.

Immediate Result.—No temperature. Pulse, 90 to 110. Restlessness. Tremor diminished.

Present Result.—One month after operation. Tachycardia, nervousness gone. Exophthalmos much diminished. Health perfect.

Pathological Examination.—Vascular and colloidal goitre.

Fourteen of these patients, seen at times varying between one month and seven and a half years following their operation, are in good health, and able to work at their avocations without discomfort. They have all lost their anxiety and nervousness.

Their muscular tremor and in all but three cases their exophthalmos have disappeared. In these cases, however, though the eyes appear prominent, they are easily covered by the lids, and are free from the "stare" and feeling of distention which the patients formerly experienced. The reason for these results I believe to be due to the removal of sufficient diseased gland tissue, and where this cannot be done, the production of atrophy in that which is left. In no one of these cases has there been a return of the symptoms relieved by the operation. This is a significant fact, which substantiates Schulz's and Mikulicz's five cases with recurrence of

symptoms and relief by a second operation. The recoveries and cures are 93.4 per cent. The mortality is 6.6 per cent.

These cases comprise all those which I have been able to trace after operation, and these cases date back to 1897. Between 1887 and 1897 I operated upon six other cases, but of these I can obtain no data after leaving the hospital. Of these six cases there was one death from an acute thyroidism in 1893. The remaining recovered and left the hospitals. No trace can be obtained of these, and, though it is to be presumed that they are at least improved, still they cannot be here included. If we consider all these cases (21) operated upon between 1887 and 1905, we have 19 recoveries and 2 deaths, 90.5 per cent. and 9.5 per cent., respectively.

One of these deaths occurred during anaesthesia, and must be considered as unavoidable. It represents purely the necessary risk to be considered in these cases.

The death from acute thyroidism in 1893 I think can be looked upon somewhat differently. The symptoms of this condition bear a very direct relation to the manner and extent of operation. Where operations are prolonged and the handling of the tissues is unavoidably severe, the reaction is usually seen in this wise. In the thirteen cases above operated upon since 1896, when the technique of the operation was better understood, only one case of acute thyroidism was seen.

The operation of partial thyroidectomy compares favorably with that of sympathectomy, if we rely upon the statistics collected by Balacescu. (*Archiv für klinische Chirurgie*, Band lxvii.) These are:

I. Division of the cervical sympathetic (Jaboulay). Eight cases, six bilateral, two unilateral. Results, 25 per cent. cured, 62+ per cent. improved, 12+ per cent. died.

II. Partial and extensive resection of the cervical sympathetic. Twenty-seven cases. Results, 33.3 per cent. cured, 40.7 per cent. improved, 7.4 per cent. failed, 18.6 per cent. died.

III. Total bilateral resection of the cervical sympathetic. Eighteen cases. Results, 55.5 per cent. cured, 27.77 per cent. improved, 11.3 per cent. recurred, 5.5 per cent. died.

I believe the case of sudden death under the chloroform should be included and not excluded from these cases. Balacescu excludes the case, and consequently has no mortality.

The best statistics here shown are the total bilateral resections, with 55.5 per cent. cured, 27.7 per cent. improved, 11.3 per cent. recurred, and 5.5 per cent. died.

Balacescu compares these cases with the results obtained in 434 cases collected by Tricomi, Starr, and Largo. These results are 30.6 per cent. cured, 44.6 per cent. improved, 10.8 per cent. failures, 13.7 per cent. died. Better statistics than these have been obtained by the operation of thyroidectomy. They are:

I. Rehn, of 119 cases collected from literature. Results, 54.8 per cent. cured, 27.9 per cent. improved, 5.9 per cent. failed, 11.4 per cent. died. Of 177 cases performed by 37 operators, results were practically the same as the above. (*Mittheilungen aus dem Grenzgebiete*, vii, 1900.)

II. Schulz (*Beiträge zur klin. Chir.*, Band xxx), 1901. Twenty cases, with 90 per cent. cured, 5 per cent. failed, 5 per cent. died.

III. Kocher. Fifty-nine cases, in which thyroidectomy was performed forty times with or without ligature of thyroid arteries or resection of other lobe. Results, 76 per cent. cured, 14 per cent. improved, 3.3 per cent. benefited, 6.7 per cent. died. (*Mittheilungen aus dem Grenzgebiete*, ix, 1902.)

The best statistics here are those of Schultz's, with 90 per cent. cured, 5 per cent. failed, 5 per cent. died. When we compare these statistics of Schulz's with those of Balacescu collected from the cases of Jonnesco, Faure, and Poignez, we find that the cures are in favor of partial thyroidectomy, and that the mortality is about the same.

There are three series of cases which will alter these statistics somewhat; they are those of Curtis, of the Mayos, and my own.

Curtis reports seven cases of bilateral total resection of the cervical sympathetic with the following results, 42.8 per cent. cured, 14.2 per cent. improved, 42.8 per cent. died. These

deaths were due to acute thyroidism and one under the anæsthetic. (ANNALS OF SURGERY, 1904, vol. xxxviii.)

If these statistics are added to Balacescu, we have 52 per cent. cured, 24 per cent. improved, 8 per cent. unimproved, and 16 per cent. died.

Curtis (*l.c.*) again reports eleven cases with 54.5 per cent. cured, 9 per cent. improved, 9 per cent. lost sight of, 27.2 per cent. died.

The Mayos report thirty-four cases, with the following results, 41.2 per cent. cured, 20.6 per cent. improved, 20.6 per cent. partially improved, and 17.6 per cent. died. (*Journal of American Medical Association*, vol. xlii.)

If Curtis's, Mayos's, and my own are added to Schulz's and Kocher's statistics, the average results are, 71 per cent. cured, 9.6 per cent. improved, 6.4 per cent. unimproved, failures, lost sight of, or partly benefited, and 12.6 per cent. died.

These statistics show that, after all, the results are about equal, but with the advantage in favor of thyroidectomy both as regards the mortality and the cures.

My object in this statistical computation is not to advocate one operation against the other, but to show that at present the results still favor the thyroidectomy.

THE SURGICAL TREATMENT OF TUBERCULAR CERVICAL LYMPH-NODES.

A STUDY OF ONE HUNDRED CASES SUBMITTED TO OPERATION.

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THE treatment of "scrofulous neck swellings" is as old as the history of medicine. Innumerable methods have been devised, and many of them are still in use. Recovery follows in a large percentage of the cases, and the treatment under which each recovery comes is sure to have its advocates. During the last two or three decades, however, as surgical technique has improved, the surgical removal of the enlarged nodes has steadily increased in favor, and is now recommended, as the method of choice, by a very large number of our prominent authorities. There is, however, a wide-spread feeling of uncertainty about the late results of operation, and there are many differences of opinion as to just what patients should be operated upon and just what kinds of operations should be done.

STUDY OF PUBLISHED STATISTICS CONCERNING THE COURSE OF THE DISEASE AND THE RESULTS OF TREATMENT.

The literature of this subject is very extensive and contains a vast fund of information. It is based largely on reports from European clinics which have been made after the examination of patients who had previously been operated upon. To review it in full would carry this paper beyond the bounds of periodical publication. There are, however, certain deductions which particularly impress one who studies it, among which I will mention three.

1. The disease is a serious one, and often leads to tuberculosis of the lungs or other parts of the body.

2. The records from thorough removal of the nodes are better than those from their partial removal or from palliative measures.

3. The prognosis is better in children than in adults.

1. The seriousness of the disease and its liability to lead to infection of the internal organs is shown in the few available records of cases treated non-surgically, and in most of the records of cases which have been treated surgically.

Demmè, in reviewing the first twenty years' work of the Jenner Children's Hospital in Berne gives the following results from 692 patients with lymph-node tuberculosis who were treated by constitutional measures, not by surgery.

Developed tuberculosis of lungs,	145	= 21 per cent.
" " intestine,	24	} 57 = 8.2 per cent.
" " pia mater,	25	
" " kidneys,	6	
" " epididymis,	2	
Total,		29.2 per cent.

These records make no mention of the bone infection, nor do they tell of the lymph-nodes themselves, and, as the observation period in many instances had been short, they do not even tell the ultimate extent of the infection of the internal organs. They do, however, indicate that such infection was very frequent.

Van Noorden learned the histories of 149 patients from the Tübingen Clinic 3 to 16 years after operation, and found that 28 had died of tuberculosis and that 14 had phthisis when examined, *i.e.*, 28 per cent. in all.

Blos's Heidelberg statistics gave, among 160 cases whose histories were known 3 to 12 years after operation, 26 per cent. of lung tuberculosis and 14 per cent. of tuberculosis in other organs, *i.e.*, 40 per cent. in all, and he quotes from the records of the universities of Vienna (49 cases), Bonn (37 cases), Breslau (92 cases), Strasburg (104 cases), and Erlangen the percentage of cases who died from tuberculosis,

almost exclusively pulmonary, as respectively 10 per cent., 11 per cent., 18 per cent., 22 per cent., 26 per cent.

Finkelstein, who did not follow his cases after they left the hospital, recorded that 51 in 456, *i.e.*, 11.2 per cent., had lung tuberculosis.

Fischer has tabulated from literature the reports of 1273 cases (including many of the above), 1 to 16 years after operation, as follows: Cured, 57.65 per cent.; local recurrences, 21.84 per cent.; died, almost entirely from tuberculosis, 13.51 per cent.

These reports certainly indicate the serious nature of the disease, even granting that in some of the cases the cervical tuberculosis may have been secondary to foci in other parts of the body.

2. It is very significant that the records of long series of cases followed through many years have come almost exclusively from the clinics where operative treatment has been used, and the tendency has been continually towards thorough operation in these clinics. The observers from the seaside hospitals of Loano, Berk zur Meer, and Margate have given records of the results of the treatment for a season or for short periods; but no record of long periods of observation of the patients after leaving the hospitals has reached the writer's notice. Cazin from Berk zur Meer favors operation, and Sutcliffe and Harnett from Margate have carefully given details of operative technique and described the class of patients to whom they should be applied.

In almost all the clinic reports reference is made to the use of constitutional treatment, injection of various substances, and different kinds of local treatment; but these have been tried to test their value, and the main reliance is placed on operations. The most definite statistics concerning the different kinds of operation which I find are those of Wohlge-muth. He divides his cases into those treated without operation, those treated by incision and curetting, and those treated by extirpation, as follows:

	Cured.		Improved.		Unimproved.		Total.
	No.	Per cent.	No.	Per cent.	No.	Per cent.	
No operation	11	24	17	37	18	39	46
Incision and curetting.....	23	63	10	27.7	3	8.3	36
Extirpation.....	32	70.5	10	22.8	3	6.4	45
Total.....	66	51.5	37	29.5	24	19	127

Other observers do not divide their cases so definitely, the operations in each series having usually been done by several men whose methods of operation have varied. There are, however, in the reports many statements which indicate the preference of the reporter, *e.g.*, Bloss states that cases treated by excision did much better than those treated by incision, and that patients treated in the latter way almost always came to the radical operation. Among his 76 cured cases there was not a single one whose only operation had been an incision, although there had been 108 "incisions" among the 429 operations in his entire series of cases.

Sutcliffe advises a thorough removal of the glands in all cases which are operated upon.

Grünfeld, who records treatment of 32 cases locally and constitutionally, 25 cases by curettement, and 125 cases by total extirpation, advises the latter as the most certain method, leading to improvement even in those patients who are not cured.

D'Arcy Power advocates thorough and early removal before caseation has taken place.

Karewski, who has operated on over 250 cases, including those reported by Wohlgemuth, and had made a careful trial of various methods of treatment, strongly advocates thorough removal by operation.

Jordan, with an experience of over 400 cases, some of them tabulated by Bloss, treated by operations of various kinds, strongly advocates thorough removal of the diseased nodes, and particularly emphasizes the futility of partial excision in those patients who have extensively adherent nodes, stating

that the resulting sinuses may be open for the rest of the patient's life.

Mitchell, reporting from Halsted's clinic (170 cases), advocates thorough operation.

Almost all operators of large experience advocate thorough operation, although there are differences in their conceptions of what constitutes thoroughness.

3. That the prognosis is better in children than in adults is very generally acknowledged. The statistics from Demmè and Wohlgemuth's non-operative cases in children are not favorable, but that may be believed to be due to the method of treatment. The results from Wohlgemuth's operated cases under ten years of age, from Poore's cases under fourteen years of age, and those of the writer's cases which are under fifteen years of age, are particularly favorable. Blos's cases did not give very favorable statistics, and only nine in the series were in the first decade of life. He and Schüller call particular attention to the much better prognosis in children than in adults.

Karewski particularly emphasizes the favorable prognosis in children as compared to adults, and refers to the 128 cases under ten years of age from his clinic, which Wohlgemuth has tabulated, followed one to six years with only three deaths from tuberculosis.

DESCRIPTION OF THE OBSERVATIONS UPON WHICH THIS REPORT IS BASED.

The patients, 100 in number, have been operated upon by the writer in St. Mary's Free Hospital for Children, the General Memorial Hospital, and in private practice between December, 1893, and February, 1904. The operations have consisted of thorough removal of the nodes with the minimum disturbance of the surrounding tissues, by the method described later, differing in this respect from most of the reported observations which include patients treated by incision, by curetting, and by excision. The ages of the patients were

57 in the first decade of life, 28 in the second decade, 9 in the third, 5 in the fourth, and 1 in the fifth.

Very careful efforts have been made to follow their later histories, a nurse having visited or written to hospital cases at intervals of six months or a year, and induced many of them to report at the hospital, where they have been personally inspected by the writer and their conditions recorded. Most of the other patients have been under the continued observation of the attending physician or of the writer. The examinations were made by the writer in 62 cases; by another physician in 14 cases; by a nurse in 6 cases; the report was made by the patient or a relative in 6 cases; 12 patients were not seen after leaving the hospital. Thirty-six of the patients were the subject of a preliminary report in this Journal in 1899. Microscopical examination of the removed nodes was made in all but eighteen of the cases, and in them the gross appearance was so characteristic of tuberculosis that the diagnosis was beyond question.

Animal inoculations were made in a few instances to study the virulence of the bacilli.

DETAILS OF THE REPORT.

We will consider in slight detail the Previous Clinical Histories, the Etiology and the Diagnosis, and in more detail the Anatomical Arrangement of the Nodes, the Technique of the Operation, and the Results.

Previous Clinical History.—The disease usually commenced insidiously, and it was impossible to learn when the nodes began to enlarge. In 38 of the obtainable histories the duration was given as less than a year, in 58 it was from one to ten years. The rapid enlargement and softening of a single node was frequently the factor which led the patient to seek surgical relief; often this node alone had been noticed, and hence the history of a rapid and short growth was given, when in reality there were many others present, and there must have been a slowly progressing growth for weeks or months. In 30

instances there were discharging sinuses when the patients first came under our observation. In 19 instances there had been previous incisions, or operations. In 47 instances the disease had become "very extensive," approaching the condition shown in Figs. 6, 7, and 12. In 21 instances both sides of the neck had become involved. There was frequently a history of a preceding pharyngitis; a large proportion of the patients applied for treatment in the late winter or in the spring, following the prevailing winter throat inflammations.

Etiology.—The majority of the patients lived in unsanitary surroundings (New York tenement houses), but at least 26 per cent. developed the disease while in very comfortable environment. Heredity seemed much less important than environment as an etiological factor.

The throat was apparently the most common portal of infection. In 86 instances (86 per cent.) the group of nodes which seemed to have been first enlarged was the one which directly receives the throat infection (Fig. 3). Many observations indicate the occasional presence of tubercle bacilli and tubercle tissue in enlarged tonsils and adenoids, *e.g.*, Lewin examined pharyngeal adenoids from 200 patients in Breslau and found tubercular infection in 10 (5 per cent.), and in grouping 905 similar observations he found records of 45 infections, *i.e.*, 5 per cent. Dieulafoy inoculated guinea-pigs from the faucial tonsils of 61 children apparently non-tubercular; in 8 instances 16.4 per cent. tuberculosis developed, and from 35 similar inoculations from the pharyngeal adenoids there were 7 tubercular infections, 20 per cent.

Coakley and others have also found tuberculosis in the faucial tonsils.

Wright, Cornet, and others have reported the finding of tubercle bacilli on healthy nasal mucous membrane. There can be no doubt that tubercle bacilli are occasionally present on or in the mucous membrane of the oropharynx, nasopharynx, and nose of persons in ordinary health.

There is also abundant evidence that the bacilli can go

through the mucous membrane and infect the lymphatics without leaving visible evidence of their transit, *e.g.*, Cornet brushed tubercle bacilli on the nasal mucous membrane of healthy animals, and later found enlarged tubercular cervical lymph-nodes with caseous spots, the mucous membrane showing no lesions.

Wright has shown a microscopical section which demonstrates a similar process in the larynx.

Goodale has shown that carmine particles pass through the mucous membrane of the tonsils, and Henderson has shown that similar absorption takes place when various powdered substances are blown on the surface of pharyngeal as well as faucial tonsils. Wright's description of this process seems to be very accurate: "The mucous membranes absorb, the lymphoid material harbors, and the lymph channels carry the tubercle bacilli."

In three instances in this series, or in the cases which the writer has since operated upon, the disease appeared in two children of the same family. In one instance a phthisical relative had spent the winter in the house a few months before. In another, one of the children had been an intimate playmate of a tubercular child. In all these six instances the first nodes involved were the upper ones of the deep cervical chain, and the probability of infection by the lodgement of bacilli in the pharynx is of course very great.

In eleven instances the submaxillary group of nodes was the first enlarged, indicating infection from the teeth or anterior part of the mouth or face. In two instances the parotid nodes were the first to show infection. In one case of neck lupus the location of the primary infection could not be determined.

Diagnosis.—The diagnosis is not always easy. It is frequently difficult to distinguish between tubercular nodes and simple hyperplastic nodes. If discharging sinuses are present, or discrete, softened nodes, or masses of nodes such as are shown in Figs. 4 and 5, or nodes smaller than these which have been steadily growing for several months, they will



FIG. 1.—Hyperplastic cervical lymph-nodes which had reached an unusual size without pus formation. Diameters of largest node, $1\frac{5}{8}$, $1\frac{3}{8}$, and $1\frac{1}{8}$ inches.

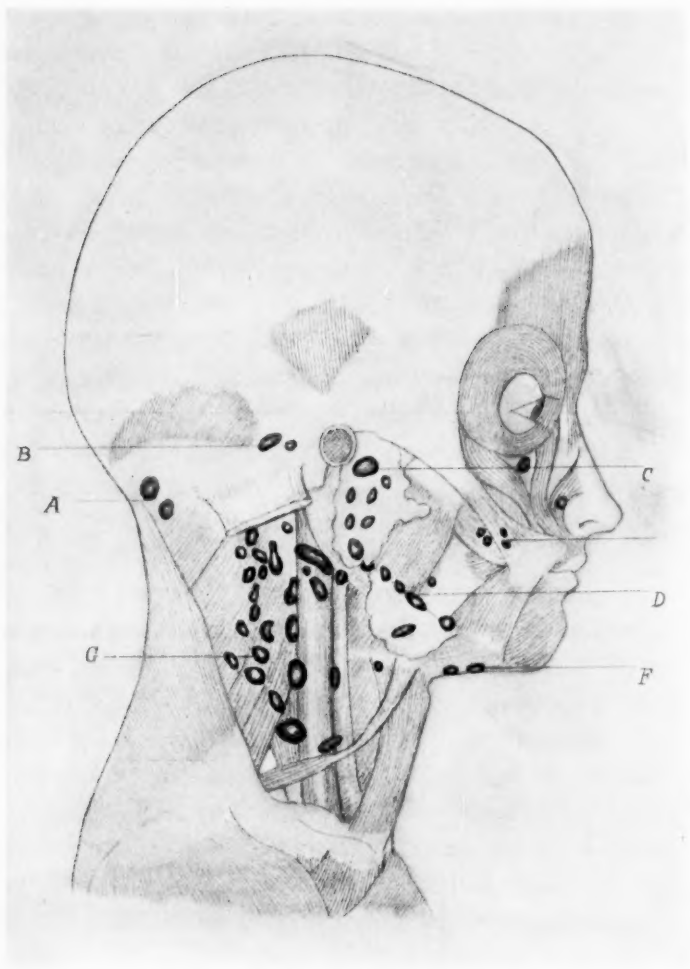


FIG. 2.—(From "The Lymphatics," Delamere, Poirier, and Cuneo.) General arrangement of the lymph-nodes in the head and neck. *A.* Occipital group; *B.* mastoid group; *C.* parotid group; *D.* submaxillary group; *E.* submental group; *F.* submental group; *G.* deep cervical chain.

usually prove to be tubercular. There are, however, many instances where hyperplastic nodes become as large as the terminal phalanx of one's thumb, alternately enlarge and diminish in size, and after months or years disappear. Fig. 1 gives the size and appearance of such nodes which had reached an unusual size, and which showed no evidence of tuberculosis on microscopical examination, nor did they recur.

In instances where the diagnosis is still doubtful after a suitable period of observation, the removal of one or more nodes for diagnosis is to be recommended; the scar need hardly be seen, and the method is surely more satisfactory than the injection of tuberculin.

Deep abscesses from acutely infected nodes, or actinomycosis, do not often give difficulties in diagnosis. Syphilis is to be borne in mind, and in doubtful cases constitutional treatment given. In lymphosarcomata the nodes usually reach a large size without becoming fluid, and they are very widely disseminated.

Branchial cysts or sinuses are usually single, and often have a distinctive location.

THE ANATOMICAL ARRANGEMENT OF THE ENLARGED NODES, which sometimes seem hopelessly complex, is really definite and reasonably simple. Fig. 2 (Poirier and Cuneo) indicates the general arrangement of the node groups in the head and neck. The deep cervical chain (*G*) is the general collector of the lymphatics of this region. There are five groups of nodes which receive the superficial lymphatics before they reach this central chain, the occipital, the mastoid, the parotid, the submaxillary, and the submental (see *a*, *b*, *c*, *d*, *f*). The latter two may also receive infection from the teeth, gums, and anterior part of the mouth.

Only in exceptional cases are any of these five groups primarily involved in tubercular inflammation. Fig. 5 shows the appearance of such involvement.

The main interest centres in the deep cervical chain, particularly in the upper nodes of this chain, which receive, either directly or through the post-pharyngeal nodes, the infections

from the pharynx, the nasal, and much of the oral mucous membranes. These upper nodes, as above stated, were apparently the first involved in 86 per cent. of these cases. The appearance of an early infection is indicated in Fig. 3. The node, *A*, is most easily felt; but the nodes, *B B*, which lie behind it under the sternocleidomastoid muscle are regularly enlarged.

Fig. 4 shows the appearance of patients with enlargement of this group. The infection spreads regularly downward along the internal jugular vein, also downward and backward towards the trapezius border and the base of the neck, as shown in Fig. 3. When the infection is widely disseminated, the submaxillary and submental groups usually become secondarily involved. The involvement of the lungs has already been referred to. The existence of a single enlarged node in this central chain is evidence that others exist, and whenever one is removed, the region under the sternocleidomastoid muscle should be explored as a routine procedure.

THE DESCRIPTION OF THE OPERATION may be given under the following headings:

1. Incisions. 2. Structures which are to be removed and structures which are to be avoided. 3. Details as to time, method of wound treatment, etc.

1. *Incisions.*—The arrangement of incisions is very important: the fear of disfiguring scars leads many to postpone operation until the most favorable time has passed, or even until tuberculosis has invaded other organs. Unsightly scars can almost always be avoided by due attention to the anatomical arrangement of the enlarged nodes and by avoiding longitudinal incisions in prominent places. Longitudinal neck scars stretch and frequently thicken. Transverse scars which follow the curves of the neck-creases do not stretch, and after a little time are hardly to be seen, a fact to which Kocher called attention many years ago, and which is continually being verified.

One frequently sees on the same neck longitudinal scars which are broad, thick, and prominent; while the transverse

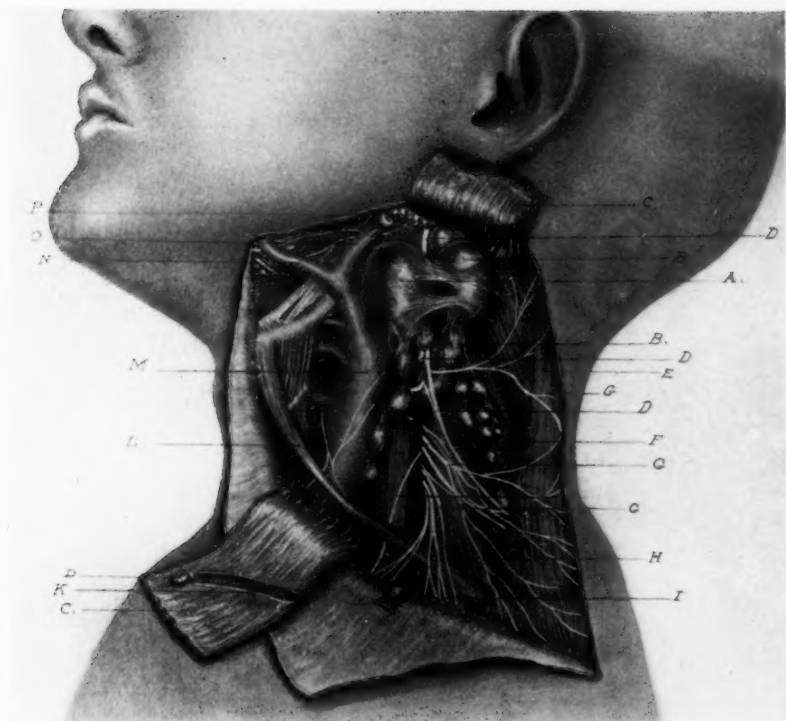


FIG. 3.—Early tubercular infection of the deep cervical chain. *A.* Most prominent caseous node; *BB.* caseous nodes under sternomastoid muscle; *CC.* sternomastoid muscle; *DDDD.* spinal accessory nerve; *E.* trapezius muscle; *F.* Levator anguli scapulae muscle; *GGG.* branches of cervical plexus; *H.* scalenus posticus muscle; *I.* external jugular vein; *K.* course of posterior branch of spinal accessory nerve cut from sternomastoid muscle; *L.* omohyoid muscle; *M.* internal jugular vein; *N.* facial vein; *O.* posterior facial vein (anterior division of temporomaxillary); *P.* parotid gland.



1.



2.



3.



4.

FIG. 4.—Photographs of patients with tubercular infection of the deep cervical chain of lymph-nodes. Nos. 1 and 2 show early infection; No. 3, abscess formation; and No. 4, inflammation of the lower as well as the upper part of the chain.



1.



2.



3.



4.

FIG. 5.—Photographs of patients with tubercular inflammation of, 1. submaxillary; 2. submental; 3 and 4. parotid groups of lymph-nodes.



FIG. 6.—A neglected case.

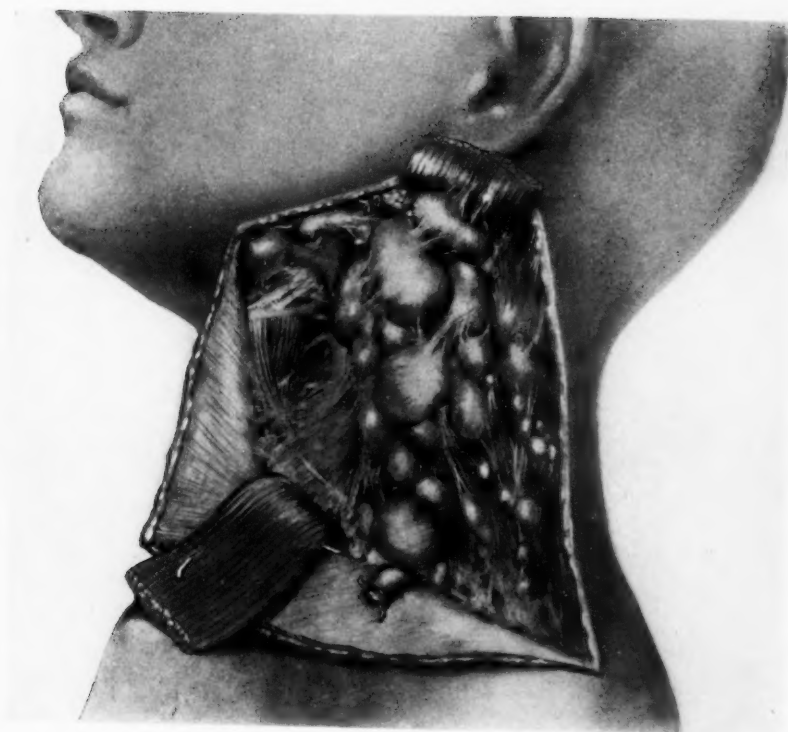


FIG. 7.—Extensive tubercular inflammation of upper and lower cervical lymph-nodes.



FIG. 8.—Incisions for removing moderately enlarged lymph-nodes. *A.* Gives access to the upper nodes of the deep cervical chain which are usually first enlarged; *B.* gives access from behind if the nodes under the sternomastoid muscle are not removed through *A.*



FIG. 9.—Two transverse incisions for removing moderately enlarged nodes.



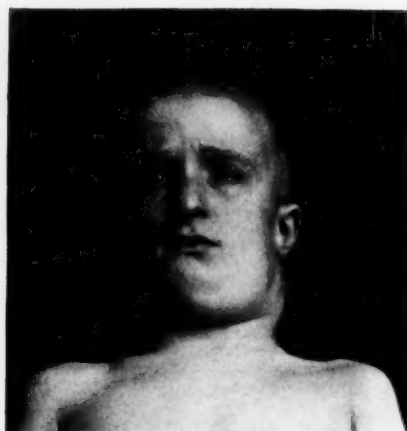
FIG. 10.—Two incisions which give access to a large part of the neck and leave little scar above the collar-line.



FIG. 11.—Photograph of patient with incisions shown in Fig. 10; taken sixteen days after operation.



1.



2.

FIG. 12.—1. Photograph of patient fourteen days after operation; "elbow" incision, anterior part transverse; posterior part along hair margin and down to shoulder; large flap turned forward. 2. Same patient before operation, showing extensive mass of nodes.

scars which were made at the same time and treated in the same way are hardly to be distinguished from the natural neck-creases.

Therefore the incision, *A* (Fig. 8), is a very important one. Through it such a group as is shown in Fig. 3 can be approached and often removed, and after healing the scar is hardly visible. Removal of the nodes through this incision is more difficult than through a longitudinal one; but the later result is so good that it may be recommended as the primary incision in nearly all cases of moderate severity. A counter-opening back of the hair-line, *B*, is used if the upper nodes cannot be satisfactorily removed through incision, *A*. For lower nodes, another transverse incision, *C* (Fig. 9), may often be used, or this and the vertical may be joined (Fig. 10). A good exposure of a large area with little noticeable scar may thus be obtained (Fig. 11). The vertical incision is, however, to be used as little as practicable, as even here it shows the characteristic tendency to stretch and thicken. In thirty-two cases one or both of these incisions have been sufficient, and without doubt the number would have been greater if they had been used earlier.

The submaxillary group can be reached by carrying the transverse incision forward. The submental group can be reached either by carrying it still further forward or by a median vertical incision. Occasionally, in far advanced cases, the transverse incision, *A*, and the vertical incision, *B*, may be joined in a curve behind the ear, and the entire flap laid forward as described in a previous paper. Fig. 12 indicates how little the scar shows after this very extensive incision. This incision has been used twenty-four times in this series. With increased experience, it seems necessary less frequently than formerly.

A very careful study has been made of the results of the incisions in these 100 cases, as well as in many cases which have been treated by other operators and others which have been permitted to suppurate without operation, and I can confidently state that operation on the plans here laid down is a

scar-saving procedure. There is less disfigurement than comes from suppuration without operation, or from small incisions in separate nodes, or from those extensive operations which are made without reference to scars.

The longitudinal incision near the anterior border of the sternomastoid muscle is probably more often used than any other, and surely should be considered. It exposes the internal jugular vein well and gives easy access to the nodes along its course, and on that account is probably the safest form of incision. It is, however, a disfiguring incision; a few months after operation the scar will usually be one-quarter of an inch wide or more, and it is in the most prominent part of the neck. This incision does not give access to the submaxillary or submental groups, nor to the posterior cervical nodes, hence additional incisions are needed for them. It should not be joined by the submaxillary incision when both are used, as the angular flap is apt to retract and leave a particularly noticeable scar.

Dollinger has reported 100 cases in whom he has removed the nodes through a vertical posterior incision alone, but most surgeons prefer some kind of an anterior incision, excepting in a few patients with long, thin necks, and non-adherent nodes.

2. *Structures which are to be Removed and Structures which are to be Avoided.*—The removal of the nodes *en masse*, together with the surrounding tissue, as though they were cancerous, is to be avoided. Important structures are injured by this procedure, although technically it appears to the operator. The removal of all the tubercular nodes is to be desired, and only so much of the adjacent tissue as is distinctly infiltrated with tubercular inflammation.

There are three structures which are particularly to be protected: the internal jugular vein, the spinal accessory nerve, and the lower fibres of the facial nerve. There are other structures which are to be heeded, but which are either less important or less likely to be injured, *e.g.*, the sternocleidomastoid muscle, the thoracic duct, the phrenic nerve, the

pneumogastric nerve, the hypoglossal nerve, the branches of the cervical plexus.

The internal jugular vein is freely exposed in almost every operation and the nodes are sometimes densely adherent to it. Traction on the nodes sometimes flattens the vein so that its margin looks like the fibrous tissue about the node capsule, and in this condition it is incised or torn. More often, however, a branch of the main vein is first injured, and in the effort to control the hæmorrhage the vein itself is clamped and torn. The posterior facial in its course from the external jugular to the anterior facial is particularly exposed to injury. The veins from the pharyngeal plexus, too, are easily injured, and, as they empty directly into the internal jugular and have no valves, bleeding from them may be very free. When, therefore, severe venous bleeding occurs in the course of an operation, it is usually best to pack the bleeding spot with gauze and turn to another part of the wound. If the hæmorrhage has been from one of the small branches, it will usually have ceased, or be so slight as to be easily controlled when the pressure is removed. If it is from the posterior or common facial, a ligature can usually be applied without injuring the internal jugular. If it is from the internal jugular itself, a running suture of fine catgut may be taken through the vein wall about the injured spot, or a lateral ligature may be applied, or the vein may be ligated above and below. In this series of cases it has been ligated five times with no ill effect. Some operators ligate it much more frequently; it is generally believed to be a harmless procedure. At least three fatal cases have been reported, however (Lenser, Kummer, Rohrbach). In two of them the remaining internal jugular was narrow, in the other it is believed to have been compressed by the bandage. Although there is seldom any ill effect from ligating one vein, one will be careful about ligating it on remembering that the tubercular nodes frequently come on both sides, and that the ligation of the second vein may be serious. Baldwin, however, reports ligating both at one operation without ill effect.

The Spinal Accessory Nerve.—This nerve is particularly exposed to injury. Between the stylomastoid foramen and its entrance into the sternomastoid muscle (Fig. 4), it usually lies between the enlarged nodes, so that if they were taken out *en masse* it must be divided. In this locality it is often flattened out, closely resembling gland capsule, and very great care is necessary to avoid it in the very locality where the nodes are most often infected. Between the sternomastoid muscle and the trapezius it is also in an exposed position, and closely resembles some of the branches of the cervical plexus. Nodes are often matted closely together in this region, too, and they should be dissected away with the utmost care. The division of this nerve is followed by an awkward drooping and weakness of the shoulder, with atrophy of the trapezius or sternocleidomastoid, or both, according to the place of division. If the ends of the nerve fail to unite, as sometimes happens, the deformity is permanent. Bailey cites a case of very serious disability from division of this nerve.

The Lower Fibres of the Facial Nerve (Ramus anastomoticus collo-mandibularis Jaffé). An unsightly paralysis of the lower lip sometimes follows incisions in the neck below the border of the jaw. It is usually temporary, but Fig. 13, 1, shows an instance in which it is permanent, following an operation which was done in Italy more than ten years ago. Fig. 13, 2, shows an instance less marked in which it was caused by pressure of the growth, not by operation, since no operation had been done. The muscle depressor labii inferioris (quadratus menti) is the chief factor in this paralysis; the nerve filament which supplies this muscle is marked *B* in Fig. 14, a drawing from a dissection made by Mr. Draper, of the College of Physicians and Surgeons. The subject has been very carefully worked out by Jaffé, also by Frohse and Bockenheimer. The former has made many dissections of this nerve twig, and has found that it sometimes accompanies the cervical filaments of the nerve three-quarters of an inch or even more below the angle of the jaw before turning upward and forward. Both Frohse and Bockenheimer call attention



1.



2.

FIG. 13.—1. Paralysis of depressor labii inferioris from section of lower filament of facial nerve more than ten years ago. 2. Partial paralysis of same muscle from pressure of enlarged nodes; no operation.

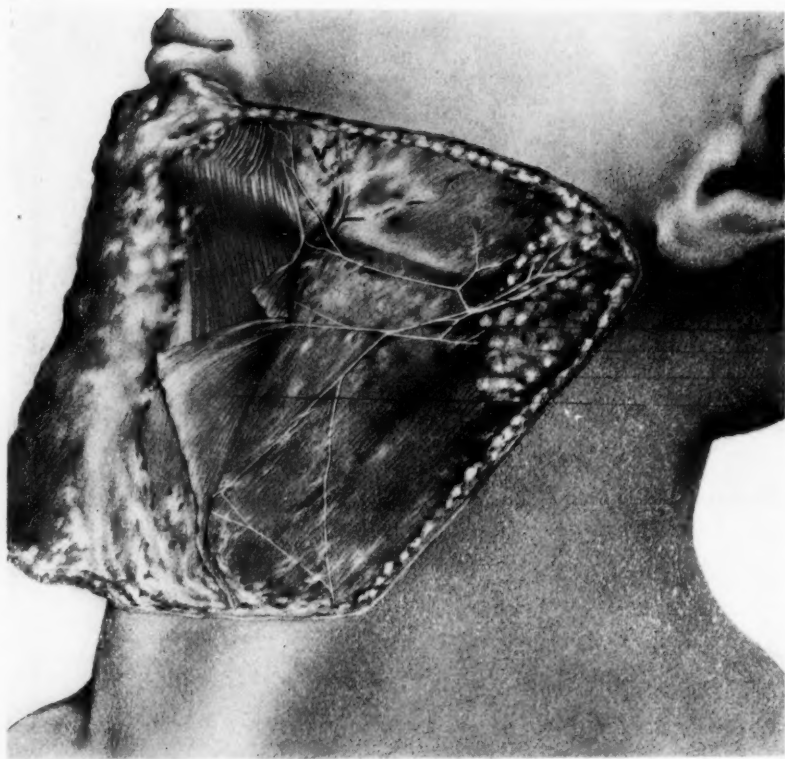


FIG. 14.—Dissection showing lower filaments of the facial nerve, especially the "Ramus anastomaticus collomandibularis," Jaffé, which supplies the depressor labii inferioris. *A.* Cervico-facial division of the facial nerve; *B.* ramus anastomaticus collomandibularis; *C.* filament to platysma myoides; *D.* parotid gland; *E.* deep cervical fascia; *F.* platysma myoides.

not only to the variations in this nerve twig itself, but to variations in the nerve supply of the lip muscles. It seems to be well established, however, that the depressor anguli oris (*triangularis menti*) receives a filament from middle branch (*ramus maximus*) of the facial, and hence does not take part in the paralysis; also that the platysma, whose fibres blend with both the quadratus and *triangularis menti*, has an influence, but only a slight one. During the past year the writer has made a very careful study of the lip muscles in the cases which have come back for observation, and has only found one marked paralysis, that in a patient for whom multiple operations had been done extending over a period of years. There has been a temporary slight paralysis in many instances. The following rules for avoiding this nerve filament may be given:

1. Transverse incisions three-quarters of an inch below the angle of the jaw seldom touch it, especially if the skin is retracted downward and the incision made through the platysma and deep cervical fascia at a little lower level.

2. Since it crosses the border of the jaw with the facial artery, incisions made in front of that artery do not touch it.

3. Since it goes into the neck at about the anterior border of the sternomastoid muscle, longitudinal incisions half an inch back of that border do not touch it.

4. Since it lies on the deep cervical fascia and below the platysma, dissections between these structures should be avoided; incisions should be made through them below the level of the skin incision, and they should be retracted upward with the filament between them.

Careful adjustment of the fascia should be made at the end of the operation, so as to favor repair if any injury has taken place.

The *Sternomastoid Muscle* need not often be divided. Occasionally the nodes cannot well be removed without it, but it is far better to leave it intact if possible. In this series of cases it was divided sixteen times, much less frequently in the later than in the earlier cases. Usually, it has been divided above the insertion of the nerve; in a few instances below the

exit of the nerve. If the case heals primarily a good muscle results, but usually it is for the removal of extensive, adherent, broken-down nodes that its section is necessary, and these are just the cases which heal slowly and leave a depression at the point of healing. The writer has never seen disability or torticollis follow its division.

Injury to the *Thoracic Duct* or one of its branches has been recorded, a rare incident, since tubercular nodes are not often found in its vicinity. Cushing, Schroeder and Plimmer, and Jordan have recorded or compiled fourteen such instances, five of them in operations for tubercular lymph-nodes. There was no serious result in any instance, the single fatality being due to other causes. Six of the cases were treated by packing, six by ligation, and two by suture.

The writer has seen a fifteenth case treated by another surgeon by ligation without ill effect. As treatment, Cushing recommends suture if possible; if not, the passing of a provisional ligature, which may be tightened if the packing does not control the oozing of chyle.

Brinton (Jordan) has shown a preparation in which the duct divided into four twigs, which reunited just before reaching the innominate vein, and anatomists tell of numerous variations in this vessel, a division and reunion of the duct being considered normal by some.

It is probable that in some of the above-mentioned cases branches of the duct, and not the main channel, have been injured.

There is hardly a possibility of injuring the phrenic, pneumogastric, sympathetic, or hypoglossal nerves if one keeps close to the capsules of the nodes. The superficial branches of the cervical plexus may easily be injured; this, however, results in nothing more important than an area of temporary anæsthesia. As has been mentioned, however, one should be careful not to mistake the lower portion of the spinal accessory nerve for one of these branches, and thus cut it.

3. *Details as to Time, Method of Wound Treatment, etc.*
—The operation is essentially slow and tedious. König states that the surgeon who undertakes it should have "iron pa-

tience and plenty of time." The dissection should be carried on with the utmost care, so that no infected nodes need be left behind.

In a child under twelve years of age, it is seldom wise to continue the operation for more than an hour at one time. Older patients show no ill effects from much longer operations; two or even three hours. Finkelstein's record of five hours, however, seems excessive.

Irrigation of the wound with normal salt solution or a 1 to 5000 mercuric bichloride solution seems desirable. I have seen no advantage follow the stronger solutions which are sometimes advised.

Drainage is advisable as a routine measure on account of the increased lymph flow which often follows the section of the lymph vessels. It should, however, be small; a few strands of silkworm gut run under the sternomastoid muscle, and usually brought out through a posterior or inferior opening and tied like a seton. I have never seen a deep phlegmon in a wound drained in this way. The serum, lymph, and blood are quickly carried into the dressing and healing is prompt.

The incisions themselves may almost always be closed at once, excepting for the spots through which the silkworm gut runs. No outside stitch-holes should be made on account of the scars, but, after sewing the divided fascia with catgut, interrupted subcuticular catgut stitches may be taken about half an inch apart.

The *dressing*, which should be bulky, and moist in infected cases, should be changed often enough to keep the wound well drained, usually daily at first.

It may not be amiss to deprecate a far too common lack of supervision when this operation is delegated to inexperienced members of hospital staffs. The writer has known of two such instances where the dissection was followed up for so long a period that the patients never rallied from the operation, and has just seen a third, which was done eight months ago, where there is an extensive recurrence in groups of nodes which were not reached; an ugly, thick, longitudinal scar

where the incision was made; a paralysis from division of the spinal accessory nerve which makes it almost impossible for the patient to get on her jacket, and a lip paralysis which is very annoying, all four of which occurrences happen to be avoidable.

RESULTS.

Early.—There was no fatality from the operation and no serious complication in the entire series of 100 cases, nor in the thirty-four additional cases which the writer has since operated upon. This indication of the safety of the operation has been excelled by other operators, *e.g.*, Jordan, Wohlge-muth, and Bloss report respectively 429, 167, and 328 cases without operation mortality, and Finkelstein reports 160 cases with one death. There was no mortality in seven of the ten series of cases which Bloss reviews. Fatalities, however, are occasionally heard of, usually following greatly prolonged operations.

Healing was complete in all but four cases at the time of the last reported observation. Two of these had lupus spots which were not completely healed, one was transferred to another hospital on account of diphtheria, and one was removed by his parents while doing well. Aside from these, there are records of 164 operations on the remaining 96 patients, with healing in the first month in 109 instances, in the second month in 43 instances, in the third month in 10 instances, at a later time in 2 instances.

Severe œdema of the face was not noticed in any case; slight temporary œdema was present in about half a dozen cases. There was no evidence that operation disseminated the tubercular infection, but, on the other hand, very strong evidence that it prevented such dissemination.

The patients were almost always out of bed in two to four days and suffered little discomfort while wearing the bandages. The healing in the simple cases was usually complete by the tenth day.

Later Results.—The particular information which is desired concerning the later history of these patients is (1) how many develop pulmonary tuberculosis; (2) how many de-

velop tuberculosis in other parts of the body; (3) how many have recurrences in the lymph-nodes; (4) what is the general health, and (5) what is the appearance of the neck?

1. In the entire list only one patient has been found to have pulmonary tuberculosis. This patient, aged 29 years, was operated on in January, 1900, for nodes involving the deep cervical chain of the left side. March, 1902, she was found to have extensively enlarged nodes on the other side of the neck; also in the submaxillary region on the side originally operated upon. The site of the original operation was free. She refused another operation. In April, 1904, she was found to have phthisis. In the meantime she had married and undergone the strain of pregnancy, parturition, and lactation.

2. One child developed double tubercular hip disease, which is quiescent, but for which she is still wearing a brace; one developed tuberculosis of the spine, from which she died. Our patient, an adult, developed tuberculosis of the cranial bones.

This showing of only one case of phthisis and three cases of bone disease in the entire series is most encouraging. It indicates the advantage of immediate, thorough operation, the good prognosis which children offer, and the position of the operation as one of the most satisfactory in surgery.

3. The study of lymph-node recurrences brings up a question of definition as to what constitutes a recurrence. It is the rule that patients seen a year after operation show hard nodes on the same side of the neck, usually about the size of beans, sometimes a little larger, sometimes smaller. It is also the rule that these nodes either diminish or remain quiescent. The following cases illustrate this point:

No. 1, aged twenty years; operation, December, 1893, about thirty nodes removed from right side of neck; February 26, 1894, other nodes removed from same side just above clavicle. Two years later there were a few bean-sized nodes in neck and in axilla several filbert-sized nodes. Operation advised and refused. Seen January, 1903. No palpable nodes in neck, and in axilla only one pea-sized node could be felt.

Case 16, boy, aged thirteen years, had a group of tubercular nodes removed from the right side of neck, December 20, 1896.

About eight months later there were bean-sized nodes below and behind the scar, and much larger ones in the left side of neck. Operation advised, but refused. Seen January, 1903, and May, 1904. In vigorous health, with no palpable neck nodes.

Case 91, aged three years. Many tubercular nodes removed from left side of neck, June 1, 1903; December 1, 1904, several filbert-sized nodes on both sides of neck. Removed. Microscopic examination; no tubercle after very careful search.

These cases are cited as examples of a condition which is not infrequent. There have been at least twelve similar ones in the series. The nodes were manifestly hyperplastic, not true recurrences. One must agree with Van Noorden that these small, hard, postoperative nodules cannot be regarded as recurrences. Volland, on examining large numbers of school children in ordinary health, found that more than 90 per cent. of them had nodules similar to these.

On the other hand, one can hardly say when any case is really cured; Van Noorden and Bos put the time limit at six years, but the writer has seen one exceptional case of recurrence below the old incision after ten years of quiescence. In this series, therefore, those cases who have a few hard nodes in the neck which are apparently quiescent are classed as *apparently cured*.

Hard, apparently quiescent filbert-sized nodules are classed as *uncertain*.

The cases may be best studied in groups according to period of observation, the long observed cases being manifestly the more important.

Group I.—Nineteen cases followed six to eleven years.

Fifteen were apparently in perfect health without palpable nodes or with a few not larger than beans.

One whose neck was well, still wore a brace for tubercular coxitis.

One had a small area of lupus on neck.

One had three or four filbert-sized nodes which had been quiescent two years.

One whose neck is now apparently free, had a few recurrent nodes removed only two months ago.

Seven of the patients had operations during the period of observation, four of them on the other side of the neck.

Group II.—Nine patients followed into the sixth year.

Eight are apparently well and free from recurrence.

One, an adult, had nodes removed from below the site of the scar ten months after the first operation; from the other side of the neck nine months ago, and now has a recurrence near the site of the last operation.

Only two patients in this group had secondary operations; one just mentioned, the other has had repeated operations, the last one seventeen months before this report, and is now very vigorous, strong, and without apparent recurrence.

In this group reference may well be made to patient No. 22, whose operation was March 4, 1898. At that time he was a very tall, slender young man of 18, with enormous nodes in his neck, believed by friends and physician to be rapidly declining from tuberculosis. He has lived in Colorado and Utah since his operation, has never had a recurrence, has been continually in active business. He now seems in perfect health, and has recently passed his physical examination, and been granted a large life insurance policy.

Group III.—Seven patients followed into the fifth year.

Four are now apparently in perfect health.

One, apparently in perfect health now, had an operation for a recurrence on other side of neck only eight months ago.

One has a few quiescent filbert-sized submental nodes.

One has phthisis and nodes on other side of neck, site of original operation free.

Two of these patients have had recurrence below the incisions, one on the opposite side of neck.

Group IV.—Eight patients followed into the fourth year.

Six are apparently perfectly well.

One, apparently perfectly well, had an operation for a recurrence below scar one and a half years ago.

One has quiescent filbert-sized submental nodes; otherwise well.

Only one case in this group had a secondary operation.

Group V.—Thirteen patients followed into the third year.

Seven are apparently well.

Two have had operations for recurrences; respectively, one year and ten months ago.

Three have recurrences in neck.

One has died of tuberculosis of spine.

Group VI.—Twenty-six patients followed into the second year.

Twenty-one are apparently well.

One is now apparently well, but had secondary operation one and a quarter years ago.

One has a single filbert-sized hard node in other side of neck, a few bean-sized nodes in both sides.

Two have small lupus spots.

One has tuberculosis of skull bones.

Only two of these patients had secondary operations.

Group VII.—Six patients followed into the first year.

Five apparently well.

One died of acute endocarditis a few weeks after leaving the hospital.

Group VIII.—Twelve patients not seen after leaving hospital.

Eleven left the hospital apparently well, with healed wounds.

One was transferred to Willard Parker Hospital before wound healed.

If tabulated, the record is as follows:

TABLE SHOWING THE RESULT BY YEARS.

Period of Observation.	6 to 10 years.	6th year.	5th year.	4th year.	3d year.	2d year.
Number of Cases.	19	9	7	8	13	26
Apparently cured	15	8	4	6	7	21
Filbert-sized nodules; diagnosis doubtful	1	..	1	1	..	1
Recurrent nodes .....	..	1	..	..	3	..
Apparently well now, but have had recent operations for recurrences...	1	..	1	1	2	1
Tubercular hip, neck well	1	..	..	..	..	..
Lupus	1	..	..	..	..	2
Phthisis .....	..	..	1	..	..	..
Tuberculosis of cranium .....	..	..	..	..	..	1
Died of tuberculosis of spine .....	..	..	..	..	1	..

Stated in percentages:

Observed over 6 years, 19 cases. Per Cent.

Apparently cured	79.
Filbert-sized nodes, diagnosis doubtful	5.2
Neck apparently well, but recent operations for recurrence	5.2
Neck well, but tubercular coxitis	5.2
Lupus spot	5.2

Observed over 3 years, 43 cases.

Apparently cured	76.7
Filbert-sized nodes, diagnosis doubtful	7.
Neck apparently well, but recent operation for recurrences	7.
Recurrent nodes	2.3
Neck well, tubercular coxitis	2.3
Lupus	2.3
Phthisis	2.3

Observed over 1 year, 82 cases.

Apparently cured	74.4
Filbert-sized nodules, diagnosis doubtful	5.
Apparently well now, but have had recent operation for recurrences	7.2
Recurrent nodes	5.
Neck well, tubercular coxitis	1.2
Lupus	3.6
Phthisis	1.2
Tuberculosis of cranium	1.2
Died from tuberculosis of spine	1.2

If we compare the adults in this group with the children, we have the following percentages:

Over 20 years of age, 14 cases. Per Cent.

Apparently cured	57.2
Filbert-sized nodes, diagnosis doubtful	7.1
Recurrent nodes	21.3
Phthisis	7.1
Tuberculosis of cranium	7.1

Under 20 years of age, 68 cases.

Apparently cured	77.9
Filbert-sized nodes, diagnosis doubtful	4.4
Apparently well now, but have had recent operations	8.8
Recurrent nodes	1.5
Neck well, tubercular coxitis	1.5
Lupus	4.4
Died from tuberculosis of spine	1.5

It is probable that some of the patients who are classed in these tables as "apparently cured" will at a later time show further tubercular inflammation, and that some of those who now have evidences of tuberculosis will eventually be cured, but the tables represent the condition of the patients so far as it could be learned.

In view of these observations, it seems fair to make, to patients with this disease or to their friends, the assurances stated in paragraph 5 of the summary.

SUMMARY.

1. Tuberculosis of the cervical lymph-nodes is apparently due to infection received from the fauces, pharynx, or nasal mucous membrane, in the great majority of cases (86 per cent. in this series).

2. The disease shows a tendency to extend to the lungs and other internal organs. Statistics indicate that such extension occurs in one-quarter to one-half of the cases from whom the nodes are not removed.

3. Entirely apart from its tendency to infect other organs, the disease is very tedious, causes great discomfort and disability, and leaves disfiguring scars.

4. The thorough removal of the diseased nodes by operation has given better results than any other method of treatment which the writer finds recorded.

5. The records of operations justify the following assurances: (a) In favorable cases: Safety of operation (many operators reporting more than 100 cases without mortality); a scar which is hardly to be seen; probable confinement to bed of two or three days; the wearing of a bandage or dressing from one and a half to three weeks; freedom from recurrence in about 75 per cent., and ultimate recovery in about 90 per cent. of the cases.

- (b) In the less favorable cases: safety of operation; less disfigurement from scars than discharging sinuses will cause; freedom from recurrence in 50 to 55 per cent., and ultimate cure in 70 to 75 per cent. of the cases.

6. Transverse incisions, either in the neck-creases or parallel to them, are usually to be used. They should be so placed that the fibres of the facial nerve will not be cut. A vertical incision back of the hair-line is occasionally helpful. Extensive incisions are necessary for the far advanced cases.

7. Every precaution should be taken to preserve the normal structures of the neck.

8. It is not feasible to divide the cases into groups, some suitable, others unsuitable for operation. Every case with tubercular cervical lymph-nodes should be operated upon unless there is a particular reason to believe that the operation would not be endured.

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DRAINAGE IN DIFFUSE SEPTIC PERITONITIS.¹

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THE term diffuse septic peritonitis as employed in this article refers to an acute septic inflammation of the peritoneum so wide-spread in extent as apparently to involve its entire surface, and which is accompanied by marked changes in the appearance of the membrane and in the quantity and quality of its fluid contents. The division of wide-spread acute peritoneal infections into two or more forms seems both cumbersome and unnecessary, as all the cases seen by me have presented the same general characteristics, varying only in degree.

This variety of peritonitis is usually due to perforation of some of the hollow viscera, with extravasation of septic material into the general peritoneal cavity. The rapidity of the process depends upon the nature of the infecting medium and upon the point at which it is released. Perforation of the stomach or duodenum is followed more rapidly by symptoms of a spreading peritonitis than a perforation of equal size taking place in the pelvic portion of the digestive tube, because gravity quickly carries the infection across the entire peritoneal cavity from top to bottom, while from the low perforations this wide-spread soiling must be brought about by the slower but no less certain agents, peristalsis and absorption.

In the class of cases under consideration the peritoneum is found everywhere deeply congested. Some portions have begun to lose their lustre, while others are already roughened and lustreless. Patches of fibrin are scattered promiscuously over the surface, and here and there may be found slight adhesions between the intestinal coils. The fluid contents of the peritoneum are usually much increased in quantity, but in some cases seen early this increase will be found to be less than the gravity of the symptoms would indicate. Serum no longer,

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the fluid will be found of varying consistency and color. At times it appears as pure pus, at others thin and of a greenish tinge. Again, and especially when less than the usual amount of fluid is found, it will be brown in color. In some cases the entire cavity seems fairly well filled. In others the fluid will be found occupying the various fossæ and the cul-de-sac.

Previous to the year 1900, the surgical treatment of diffuse septic peritonitis was attended by results which tended neither to establish it as the method of choice nor to furnish an agreeable retrospect for those of us who now "know better."

With a mortality rate approaching 100 per cent., these cases were viewed with dismay by the surgeon. Better knowledge of the etiology and pathology of the condition demanded that the patient be given the chance for life which surgery alone could offer, but the knowledge necessary to the proper application of this means of relief was acquired more slowly and at tremendous cost. Actuated by a sense of stern duty, regardless of consequences to himself or to his professional reputation, the surgeon operated upon such cases as were not actually moribund, employing the methods which at the particular time were accepted as correct, and was then compelled in most instances to watch the steady and relentless progress of the disease to a fatal termination.

During this period of discouraging experiences we gladly welcomed and eagerly adopted any suggestion as to the management of these cases which seemed rational, and which had in the experience of a trained operator proved even of slight benefit. Within a comparatively brief period the following procedures were advanced and more or less generally applied by the surgical world in the effort to conquer the dread disease.

The cleansing of the peritoneum by evisceration and dry sponging. By dry sponging without evisceration. By copious irrigation of the entire sac at the time of the operation. By continuous irrigation maintained for hours or days after operation. By more or less limited irrigation applied to the region

from which the infection originated. By simply affording an outlet for the escape of pent-up, septic fluid, making no further effort to hasten its removal.

The attempt to drain the peritoneal cavity into the intestine by introducing through a trocar large quantities of saline purgatives into the small intestine at the time of operation.

Capillary drainage by multiple or single strands of iodoform gauze, then plain gauze, then wicking, then the cigarette drains large and small, one or many.

Glass drainage-tubes, large and small, straight or crooked, inserted here and inserted there.

Rubber drainage-tubes of all sorts and sizes used with or without gauze. The wound was left wide open filled with gauze drains, was partly closed about the drains or was closed tightly with no drainage. Counteropenings for drainage were made in the loin and flank. Careful dissection of the male perineum to permit the passage of a tube into the lower pelvis was recommended. Vaginal drainage, by tube or gauze or both, also belongs to the list. Then we find ourselves attempting to drain this septic area into the already choking lymphatics of the sufferer by raising the foot of the bed and flooding the diaphragmatic or absorbent area of the peritoneum with the contained septic fluids.

The variety of methods above mentioned as well as the many opposing principles represented by them graphically portray the unsettled and dissatisfied state of the surgical mind regarding the treatment of this disorder.

In 1900, Dr. George Ryerson Fowler, of Brooklyn, published an article describing postural postoperative treatment of diffuse septic peritonitis. The article above mentioned marked a new area in the history of this disease, supported as it was by the records of nine consecutive cases which recovered. Never before had any one been able to report such a series of successes in its treatment; and, in fact, it is questionable whether so many recoveries had up to this time occurred in the practice of any one man. To most of us the description of the elevated head and trunk posture came with

telling force. We had so long and patiently tried the various exploited methods of combating diffuse septic peritonitis, with such distressingly unsatisfactory results, that the vista thus suddenly opened before us seemed too good to be true.

As has been shown by Fowler, Clark, and others, absorption takes place most rapidly from the diaphragmatic peritoneum, particularly around the central tendon of the diaphragm, and the absorbent qualities of the membrane steadily diminish from this point downward, until, in the lower pelvis, we find that a localized septic process may exist for many days without exciting much constitutional disturbance.

In view of the fact that the position advocated by Fowler accomplishes what common sense should dictate in the light of our knowledge of the physiology of the peritoneum, we wonder that its employment was not sooner urged. In our work involving the treatment of septic processes, we strive unceasingly to accomplish, as completely as possible, their localization to the part first attacked, and to provide for the products of infection the freest external drainage. The treatment of peritoneal infections offers no exception to the above general rule, and, in my judgment, the greatest advance yet made in the furtherance of this treatment is the elevation of the head and trunk, thereby draining the high and extremely dangerous area of the cavity, with its numerous mouths, large, wide open, and hungry for septic material, into the lower and safer area where absorption through lymph channels will not take place more rapidly than will the escape of the poison through well placed external drains.

The results following any method of treatment of diffuse septic peritonitis will be more or less dependent upon several factors, among which may be mentioned the nature of the infection, the resistance of the patient, and the length of time elapsing between the onset of the peritonitis and the operation. The nature of the disease will ever cause it to be classed among the most formidable of acute surgical disorders.

Believing fully that free drainage of the infected peritoneum is the essential factor in its successful treatment, I

desire to briefly describe the technique which I have employed since December, 1902, at which time a preliminary report was made.

Since the above date nineteen cases of diffuse septic peritonitis have been operated upon with seventeen recoveries and two deaths. Ten of the cases were of appendicular origin, one following perforation of a duodenal ulcer, one following perforation of a gastric ulcer, one due to rupture of the gall-bladder, two to ruptured pus-tubes, two following rupture of a suppurating ovarian cyst, and two were cases of postoperative peritonitis, one following an abdominal hysterectomy, the other following an appendectomy. Of the fatal cases one was of appendicular origin and the other due to rupture of a large suppurating ovarian cyst. These were all cases of diffuse septic peritonitis, involving, so far as could be seen, all of the peritoneal surface, characterized by the local changes described early in the paper and by the presence of symptoms of extreme gravity. No cases of peritonitis, even of a severe type which were more or less localized, are included in the list. (It may, however, be stated that during the period in which these cases were operated upon some cases of diffuse septic peritonitis were seen in which operation was refused because the patients were moribund.)

In all cases of diffuse septic peritonitis the incision should be ample, and should be made in the median line, the better to facilitate the thorough cleansing of the cavity. When the infection is due to contamination from the upper abdominal viscera, the incision will of course be made above the umbilicus.

The first step will be to find the source of the infection and to prevent further soiling of the cavity by making immediate and thorough repair of the diseased part or parts. A two-inch incision is then made in the median line just above the symphysis, and through this a large rubber tube, one to one and one-half inches in diameter, split from end to end and carrying a gauze wick, introduced to the bottom of the pelvis. In females the posterior cul-de-sac is freely opened into the vagina, the lower abdominal incision rendering its accomplishment possi-

ble in a moment, and a similar tube without the gauze wick introduced through the cul-de-sac into the vagina. The abdominal cavity is now thoroughly washed out with gallons of hot salt solution, care being taken to reach all the fossæ and areas where septic fluid may lie more or less concealed. The upper incision is then rapidly closed with through-and-through sutures. Before tying the last stitch, enough of the saline solution is introduced through a funnel to entirely fill the abdomen. The lower wound is left open, and in males an additional tube similar to the first, but without the wick, is introduced to the bottom of the pelvis alongside the first. The patient is then raised while yet on the table to the sitting posture, which is maintained while transferring him to the bed. He is placed still in the sitting posture in the bed, the head of which has been raised from twenty-four to thirty inches from the floor.

The dressings require close attention and frequent renewal, as drainage for the first few hours will be most profuse. When the solution left in the abdomen has escaped and drainage is becoming scanty, the fluid, which in males tends to accumulate in small quantities in the lower point of the pelvis, is pumped out every two hours through the plain tube, thus decreasing the demands upon the capillary drainage furnished by the mixed drain of tube and gauze. In females no such accumulation occurs, as the vaginal drains tap the lowest point of the peritoneal sac. This pumping-out process may usually be discontinued at the end of twenty-four hours. All tubes may be withdrawn, as a rule, in from five to eight days, depending upon the indications of the particular case.

For infections originating in the lower abdomen or pelvis, the incision is made below the umbilicus, extending to the symphysis. Having effectually dealt with the source of the infection, the abdomen is thoroughly flushed out, as described above, the drains placed in the same manner and the wound closed down to the tube, or tubes, never, however, so closely as to choke them. The subsequent management is exactly the same as that above detailed.

I believe that leaving in the abdominal cavity a large amount of salt solution exercises a very valuable influence, as this, owing to the elevated head and trunk posture, establishes a strong drainage current in the right direction, *i.e.*, towards the lower pelvis, where it is easily and rapidly taken care of by the ample drains provided.

The indiscriminate and promiscuous introduction of gauze or tube drains here and there in various directions throughout the cavity is considered not only as a useless but a really harmful practice. Such drains are rapidly shut in by adhesions, drain nothing, and greatly increase the danger of postoperative obstruction.

The lowest point of any cavity is the logical point to drain, and when, by posture, we insure the gravitation of the abdominal fluids to the lower pelvis, free drainage at this point is both necessary and sufficient.

As to drainage material: I have discarded all forms but two. When a capillary drain is required, the combined tube and gauze drain, consisting of a soft rubber tube at least one inch in diameter, split from end to end, and carrying a wick of iodoform gauze which fits loosely its lumen, is employed. When capillary drainage is not demanded, as, for instance, in the vaginal drains, a similar tube without the wick is used. These drains are always available, are easily introduced, conform to the shape of the drainage track, and last, but not least, they are very easily withdrawn.

Since adopting the technique above described, the mortality of this disease has in my hands been reduced from 90 per cent. to 11 per cent. approximately. Included in the list of cases reported in this article are two of diffuse, septic, postoperative peritonitis, both of which recovered. So far as I am aware, but very few recoveries have been recorded following the treatment of postoperative peritonitis by any plan, active or passive; and I wish to reaffirm a statement made in a former article upon this subject in December, 1902, that by this method of treatment these cases of postoperative peritonitis formerly considered hopeless have been transferred from the hopeless to the hopeful class.

In conclusion, I should like to emphasize the following points:

1. Operations for diffuse septic peritonitis should be made as quickly and with as little manipulation as is compatible with thoroughness.

2. Evisceration, partial or complete, greatly increases shock and the prospects of a fatal result.

3. The generous use of clean, hot water will most thoroughly cleanse the infected cavity with the least traumatism.

4. Drainage is simplified by collecting the peritoneal fluid at one point where drains may be easily placed. The elevated head and trunk posture followed by the gravitation of fluid to the lower pelvis best accomplishes this.

5. Results following the surgical treatment of diffuse septic peritonitis will be improved should each individual operator adopt some definite form of procedure in such cases, which, being well understood by operator and assistants, may be methodically, speedily, and thoroughly carried out.

PENETRATING BULLET WOUND OF ABDOMEN PASSING THROUGH THE SPLEEN, STOMACH, VERTEBRA, AND SPINAL CORD.¹

LAPAROTOMY AND SUTURE OF STOMACH WOUNDS; RECOVERY. SUBSEQUENT LAMINECTOMY AND REMOVAL OF BULLET FROM SPINAL CORD; RECOVERY.

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On July 11, 1904, at 7.45 A.M., Mrs. J. A., twenty years of age, was shot at close range with a .32-caliber revolver, while walking on the street. The bullet entered the left side of the body at the level of the eighth rib. She was immediately taken to the Rhode Island Hospital by the ambulance in a state of collapse. On admission physical examination showed a well-developed and fairly well nourished young woman. The skin and mucous membranes were very pale. The pupils equal and slightly dilated. The heart and lungs were examined hurriedly and found negative. The wound of entrance made by the bullet was found on the left side of the trunk over the eighth rib, in the anterior axillary line, surrounded by an area of burnt and discolored skin roughly three inches in diameter. The abdomen was tender on palpation. There was no dulness in the flanks, but marked rigidity of the abdominal muscles. There was complete motor paralysis of both lower extremities, though the patient could move both thighs a trifle, probably owing to the ability to use the psoas muscle. Both lower extremities were hyperæsthetic; even the weight of the bed-clothing being painful, with the exception of an area on the left leg supplied by the fourth lumbar nerve, which was anæsthetic. The pulse was rapid and of poor volume and tension. The bladder was catheterized and normal urine obtained. The patient was taken to the operating room for operation, which was begun at 9.30 A.M. A vertical incision through the abdominal wall, roughly six inches in length, along the outer border of the

¹ Read before the Rhode Island Medical Society, March 2, 1905.

left rectus, was made. This wound was later enlarged by a second incision from about its centre running outward and downward and to the left for a distance of about three inches. The muscles of the abdominal wall were separated in the direction of their fibres. The abdominal cavity was full of fresh and clotted blood. The bullet was found to have passed through the lower border of the spleen, the mesocolon, cutting a branch of the splenic artery,

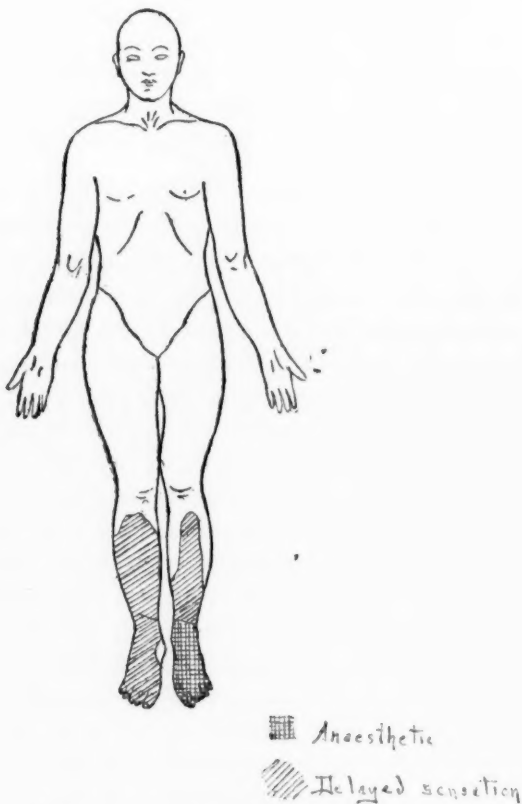


FIG. 2.—Areas of abnormal sensation, February 8, 1905.

from which the hæmorrhage had come, and which was still bleeding freely; in and out of the posterior surface of the greater curvature of the stomach, but no opening in the vertebra could be felt. No great amount of stomach contents was found in the abdominal cavity. The bleeding vessel in the mesocolon was tied with catgut. The openings in the stomach wall were closed with

FIG. 1.—Skiagraph showing relation of bullet to first lumbar vertebra.



a purse-string suture, over which were placed Lembert sutures of black silk. The spleen was not bleeding, and the wound in it was left alone. The abdominal cavity was flushed out with saline solution and a good-sized iodoform gauze drain left in leading to the rupture in the stomach wall. The bleeding was apparently controlled by ligation of the bleeding artery in the mesocolon. The abdominal wall was closed in layers with black silk. The patient stood the operation well, and was given 1200 cubic centimetres of saline intravenously during the operation. She made a good recovery from the ether. Pulse was rapid but fairly good throughout the night. She had considerable paroxysmal pains in the knees during the night, requiring one-sixth grain of morphia subcutaneously. The day following the operation the anæsthesia on the left leg had disappeared.

The second day she complained of numbness in the legs and was able to move the toes. She was very thirsty, and was allowed one drachm of water every hour.

On the fourth day she was allowed one-half ounce of milk every hour.

On the fifth day involuntary micturition appeared for the first time.

On the sixth day a small bed-sore appeared over the sacral area, and she had involuntary bowel movements.

On the seventh day the wick was removed from the abdominal wound, and considerable pus escaped from behind it. Patient again complained of pain in the legs and also in the bladder region, which seemed to be relieved by frequent catheterization.

On the ninth day a soft egg on toast was added to the diet. There was a moderate amount of pus from the wound. Leucocyte count showed 16,400.

On the tenth day an X-ray was taken, being an anteroposterior view of the body. This showed a bullet in the line with the body of the first lumbar vertebra pointing up. Leucocyte count 17,680. Ability to move the legs was increasing, but the patient did not move the left as well as the right.

On the sixteenth day a second X-ray was taken, the light being thrown from the side at a definite angle. This showed a bullet apparently lying in the spinal canal. The pain in the legs extreme. Leucocyte count, 16,200.

On July 30, or nineteen days after the shooting, a laminectomy was performed with the hopes that the removal of the bullet might be followed by relief of her distressing pains, and to a certain extent her paralysis. The patient was placed face downward on the table. An incision about five inches long was made in the median line, between the eleventh dorsal and the fourth lumbar vertebræ. The muscles and fascia were dissected away from the spinous processes and laminæ of the vertebræ on either side. Bleeding was controlled chiefly by packing each side of the spinous processes with gauze for a couple of minutes. With the idea in view of trying to save the long spinous ligament in order not to weaken the back too much, the following operation was planned and carried out. First the spinous processes of the twelfth dorsal and first and second lumbar vertebræ were split longitudinally, with a thin-bladed saw, down to the laminæ. The supra- and interspinous ligaments were then split longitudinally with a knife, this division making a straight line with the division of the spinous processes. Next the spinous processes were severed from the laminæ with a heavy wire cutter shaped like a blacksmith's tongs. In order now to get at the laminæ and still preserve the ligament so that it could be replaced, I severed each half of the split ligament at opposite ends after the manner of tendon lengthening. These two halves of the ligament, including the halves of three spinous processes, were then turned out on either side and the spinal canal opened in the usual manner. (Fig. 4.) The bullet lay under the lamina of the twelfth dorsal vertebra in the right posterior quadrant of the spinal cord, which latter must have been traversed by the projectile and was considerably lacerated. The bullet was easily seen and removed without further disturbing the cord. A drain of plain gauze was led down to the rent in the meninges, which I made no attempt to close. The two halves of the supraspinous ligament were reapproximated and sutured with black silk, restoring its continuity. The muscle and skin incisions were closed with black silk sutures, leaving a small opening for the drain. The patient stood the operation as well as could be expected. She was put to bed on a Bradford frame face downward. She made a good recovery from ether.

On the second day after the laminectomy voluntary control of the tibiales antici was noted to be present, but weak. She moved the right quadriceps and adductors. The same held true of the

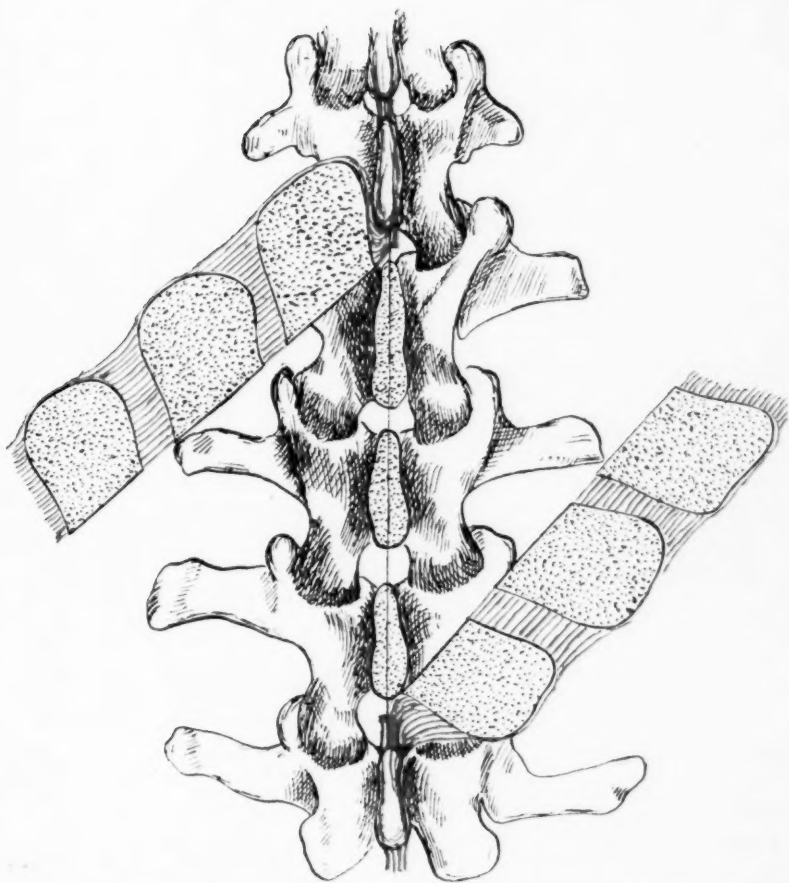


FIG. 4.—Showing method of splitting spinous processes, the supra- and interspinous ligaments, before cutting away the laminae.

left side, except that the impulse was weaker and the quadriceps extensor did not respond.

On the third day she complained of itching of the skin of the abdomen and legs and pain in the left knee.

On the sixth day the sutures were removed from the back and she was turned onto her back, as she could not bear the stomach position.

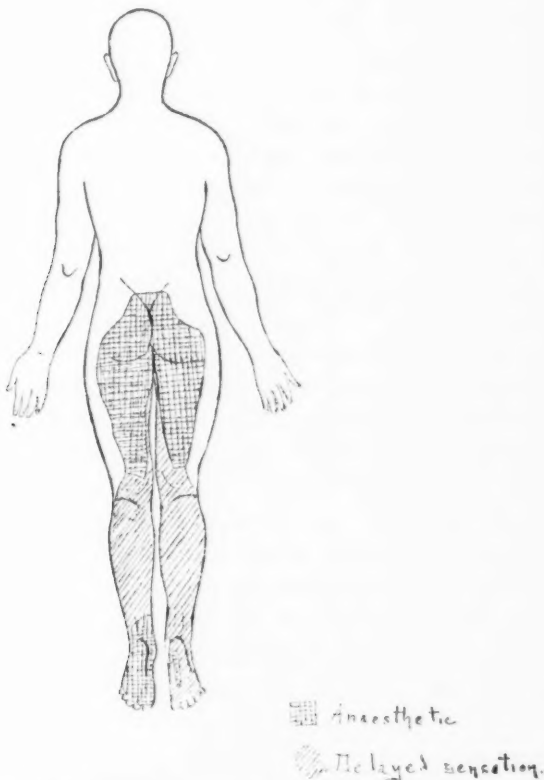


FIG. 3.—Areas of abnormal sensation, February 8, 1905.

On August 18, or thirty-eight days after she was shot, the abdominal wound was entirely healed, but there still persisted a small sinus in the incision in the back. On this day she was sent out of doors in a go-cart on a Bradford frame.

On August 22, or the twenty-third day after the laminectomy, a plaster jacket was applied, and the patient was able to go out of doors in a wheel-chair for three hours. She was much more comfortable with the jacket on.

On August 31, having been out of doors daily since the jacket was applied, she was allowed to go home in the ambulance. She was at this time running a little temperature, but the pain in the legs was the symptom most complained of.

The history since leaving the hospital has been one of gradual convalescence. For the first six weeks after returning home the patient suffered much pain periodically in her knees and legs, with occasional and sometimes frequent pains in her bladder. The bed-sore over the sacrum was very resistant, but finally healed towards the latter part of November. The plaster jacket was removed after it had been on three weeks because the continual dribbling of urine soaked into the plaster and made it offensive. There has been no complaint of any pain in the back at the site of the laminectomy wound, which healed per primam, except for a slight sinus caused by the wick to the spinal cord, which persisted for a number of days and then closed. Since the middle of October, when the patient made a marked change for the better, convalescence has been rapid. She gained in weight and in ability to move her previously paralyzed muscles, and there has been a gradual subsidence of pain in both legs and bladder. There was noticed at this time also an ability to hold her water for several minutes at a time, but when the desire came the urine was passed before she could dispose of it properly. She was up in a wheelchair daily. By the 1st of November she took a few steps each day with a member of her family on each side to support her, and by the 1st of December she was able to get about on crutches.

On December 18 she took a few steps alone without any support. At the present time she can walk alone, though her muscle power is still too weak for very much exertion. She may be said at this time to have regained almost complete control over her vesical sphincter, though at times this is apt to demand hurried attention. The bowels move, though they usually require enemata.

February 8, 1905, Dr. George L. Shattuck kindly tested the skin sensation of both lower extremities. He found a more or less saddle-shaped area of anæsthesia to tactile and temperature sense. This was quite symmetrical, starting on the sacrum behind and curving outward towards the trochanters, and then turning downward and involving the posterior surface of the thighs as far as the upper border of the popliteal spaces. This

area of anæsthesia then involved the inner part of the thighs, including the labiæ. The whole surface of the left foot, including the ankle, and a narrow strip on the right sole were anæsthetic. Everywhere else on both extremities, with the exception of the anterior surface of both thighs as low as the tibial tubercles, sensation was delayed though present. All muscles of both lower extremities gave the reaction of degeneration. Though sensation was delayed or altogether lost in places and normal in others, there were no sharp lines of demarcation to correspond with the distribution of any one nerve. A transverse myelitis must have been set up by the injury to the cord, caused by the passage through it of the bullet in order to produce the paralysis of the bladder sphincter, noted for the first time on the fifth day after the injury was received. The recovery from this lesion is of necessity a slow one, but if the patient continues to regain her lost functions at the present rate of progress, I believe we may look for a disappearance of almost all motor and sensory disturbances.

SOME REMARKS ON CASES INVOLVING OPERATIVE LOSS OF CONTINUITY OF THE COMMON BILE DUCT.

WITH THE REPORT OF A CASE OF ANASTOMOSIS BETWEEN THE HEPATIC DUCT AND THE DUODENUM.

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IN 1100 operations upon the gall-bladder and bile passages which have occurred in the hands of Dr. Charles H. Mayo and myself up to March 27, 1905, 159 were upon the common duct of the liver, and of these latter seven have involved complete loss of the continuity of the common bile duct as a direct result of the operation, five were intentionally produced in the attempt to remove a malignant neoplasm, one was accidentally caused, and one followed an extensive operation for gall-stone disease. The latter forming the case reported in detail.

The possibility of union between the divided ends of the common duct was first brought to our attention in an unfortunate manner. During the removal of a deeply situated and densely adherent gall-bladder, the common duct was accidentally divided. The ends were widely separated before the accident was discovered, rendering detection of the distal end a matter of some difficulty. The proximal fragment was easily identified by the escape of bile. The common duct was of normal size, which rendered suturing difficult and uncertain. It was accomplished in the following manner: three catgut sutures were placed in the remnants of peritoneum, adhesions, and right margin of the gastrohepatic ligament, drawing the duct ends into apposition; five fine catgut sutures were then introduced through all the coats of the common duct throughout three-fourths of its circumference, leaving a gap anteriorly for drainage. We simply reproduced as nearly as we could the

condition which exists after choledochotomy for stone. The external bile discharge ceased in sixteen days, patient discharged on the twenty-second day, and has had no further trouble, now nearly two years.

This instance taught that fine catgut would hold a sufficient time for union to take place, and was not open to the objection to silk in the latter's liability to secondary stone formation, such as occurred in the reported case of Homan's. It also demonstrated that no harm followed taking all the duct coats firmly in a single suture.

Within a year we had an opportunity to apply the same technique to a case of carcinoma of the gall-bladder which extended down the cystic duct to the common duct, and in which the gall-bladder, cystic duct, and three-fourths inch of the common duct were excised. In this case the second portion of the duodenum was loosened from its bed after the manner of Kocher in his gastroduodenostomy, the intestine was drawn to the right and held by catgut sutures to the neighboring tissues. The patient made a good recovery and remained well until a return of the growth thirteen months later (*Medical Record*, April 30, 1904).

The condition of the third case was due to a small, very hard, malignant growth in the common duct causing obstructive jaundice. The tumor and nearly an inch of the common duct was excised and the ends sutured as in Cases I and II. The patient, however, died from capillary hæmorrhage on the third day, without fully recovering from the initial shock.

Our first attempt at direct union of the common bile duct to the duodenum came about through an effort to remove, what we supposed at the time to be, a stone impacted in the common duct, just in the margin of the pancreas and underneath the edge of the duodenum. The duodenum was loosened on its right side, turned upward and to the left. The duct was incised and the supposed stone found to be a typical duct carcinoma, hard, grayish white, and well defined. It was excised and the space closed by catgut sutures. The common duct was reinserted at a new location in the duodenum, at a

point where it was covered by peritoneum, after the plan so successfully used by Halsted; catgut was again used as a suture material. A wick drain was inserted down to the suture line. This was a mistake. There was no leakage until the drain was removed, which did not take place until the end of a week. The plastic lymph, which should have protected the suture line, became entangled in the meshes of the gauze, causing difficulty and delay in removal, and so disturbed the union as to allow a minute fistula to form. This gradually increased in size from the biliary and duodenal discharge until the patient was exhausted and died at the end of the eighth week. The lesson taught was that a gauze drain should never be placed directly against an anastomotic suture line. The feasibility of union between the duct and the duodenum at a peritoneal covered situation was manifest by the temporary recovery of the patient.

The fifth case was reported in conjunction with a paper on cholecystectomy at the meeting of the American Medical Association, Surgical Section, 1900 (*The Journal*, December, 1900). In this patient we excised the cancerous gall-bladder with a tongue-like overlying portion of the liver, together with the whole of the cystic duct and part of the common and hepatic ducts. An unsuccessful effort at union of the deep duct was made. The operation was very easy from the fact that the liver was exceedingly movable and the ducts elongated. All the bile escaped from the external wound, to the great distress of the patient, until death occurred nine weeks later.

The sixth case, which concerned the successful removal of a carcinoma of the papilla and diverticulum of Vater, was reported in the *St. Paul Medical Journal*, June, 1901, but has no bearing on the subject under discussion.

The writer has most briefly reviewed some features of these cases to illustrate a few facts which experience teaches and which may be summarized as follows: first, the common duct may be united end to end, by through-and-through catgut sutures. It is essential that a few supporting sutures should be placed in the surrounding tissues, and that a portion of the

circumference of the line of union be left open for relief of tension and drainage. Second, the common, and in certain cases the hepatic, duct may be implanted into the duodenum, provided a peritoneal covered portion of the intestine be chosen for the purpose. Third, to facilitate these operations, the second portion of the duodenum should be loosened and drawn to the right and held by fixation sutures, preventing tension on the duct suture line. Fourth, drainage, if necessary, should be pliable, covered with rubber tissue, and placed as distant to the suture line as will serve the purpose of protection against leakage.

In the following case the successful outcome was due to the care with which we were able to carry out these details.

CASE VII.—*Cholecystectomy and Choledochotomy followed by Extensive Stricture of Common Duct which was relieved by Secondary Anastomosis between the Hepatic Duct and Duodenum.*—Mrs. L. I., aged twenty-two years; mother of two children; admitted to St. Mary's Hospital, June 30, 1903, with the following history. For four years has suffered with "stomach cramps" and pain in right hypochondrium which passed through to the right shoulder. In one of these attacks she had been slightly jaundiced. Ten days ago an attack similar to the previous ones came on, but did not stop as before. The intense pain subsided, but was replaced by frequent colicky pains, nausea, chills, and fever. Stools were clay colored. Family and personal history other than above, negative. Examination, a slightly built woman five feet two inches in height; weight, ninety-eight pounds; heart and lungs, normal; urine contained bile, a trace of albumen, and a few hyaline casts. A moderate leucocytosis was present; temperature, 101° F.; pulse, 110; icterus fairly well marked; deep pressure over gall-bladder region during inspiration developed resistance and an indefinite sense of tumefaction. No other relevant physical findings. Diagnosis, gall-stones in gall-bladder and common duct. Operation, July 1, 1903. Through a four-inch straight incision in upper right rectus muscle a contracted, thick walled gall-bladder filled with stones was exposed. The superior angle of the incision was carried upward and inward along the costal margin, after the method of Bevan, and the common duct palpated and inspected.

It was full of stones and débris and closely adherent to the duodenum and surrounding structures. The gall-bladder was removed from below upward without opening its cavity. The cystic duct was slit downward into the common duct, which was freely opened. The common duct was dilated to the size of a lead-pencil and filled with putty-like material and stones, all of which was removed with a scoop. During the process, dark, flocculent bile appeared. The cleaning process was difficult, and when completed the duct was seen to be greatly thickened and the mucous membrane eroded. A few interrupted catgut sutures were introduced in the incised duct up to the entrance of the cystic duct. At this point an opening was left into which a fish-tailed rubber tube one-quarter of an inch in diameter was introduced and held by two fine catgut sutures. Around this a moderate amount of gauze was placed and protected by gutta-percha tissue, the whole being allowed to protrude from the upper angle of the abdominal incision. The operation lasted three-quarters of an hour. Patient reacted well, but was in a rather critical condition for several days, until normal bile in quantity made its appearance. Drains all out on the eleventh day; patient discharged on the twentieth day with a healed wound, bile freely present in the stool.

Readmitted May 25, 1904. Patient stated that for about five months she had been quite well, doing her housework, and had gained ten pounds in weight. About this time noticed some general skin pruritus, slight jaundice, and an unpleasant sensation in the stomach. This rapidly increased, and was followed by chills and fever, clay-colored stools, and severe illness. She was in bed for five weeks; eventually, the old drainage tract in the former incision opened up and discharged bile freely, with marked improvement. From that time until admission, the fistula discharged at intervals with temporary betterment. The periods during which the fistula remained closed were marked by severe symptoms, jaundice, nausea, chills, and fever. At the time of readmission fistula was not open. Patient emaciated, weight eighty-one pounds, jaundice extreme, chills, fever, and sweating, with colicky pains of daily occurrence. Pulse-rate, 120; temperature variable from subnormal to 103° F.; general debility marked.

May 26, 1904, under ether anæsthesia, and with the patient

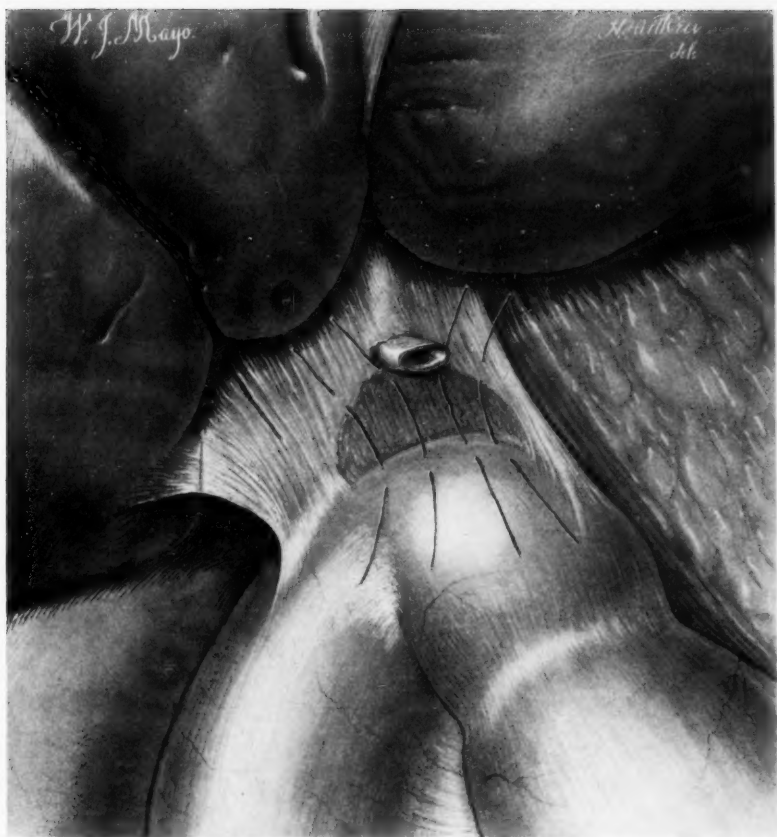


FIG. 1.—Liver raised upward. End of hepatic duct freed and sutures placed ready to draw duodenum into position. Note that gall-bladder was removed at previous operation.



FIG. 2.—Fixation sutures tied, duodenum incised, and posterior row of through-and-through sutures in place.



FIG. 3.—All posterior sutures in place and tied, ready for lateral and anterior sutures.

in Robson position, a five-inch incision was made just internal to and parallel with the cicatrix of the former wound. A dense tangle of adhesions was encountered, involving transverse colon, duodenum, and stomach on the one side, and the liver and ducts on the other. By following the remains of the fistulous tract carefully and keeping close to the liver, the original drainage opening at the site of the cystic duct was discovered. The hepatic duct was dilated and easily admitted the tip of the index-finger to the primary division. The common duct was reduced by cicatricial contraction to a fibrous cord, along which could be traced a little stain of bile. During the separation of adhesions, it was noted that the duodenum overlapped the remains of the common duct and formed one wall of the fistulous tract in its deeper portion. The external incision was continued to the sternal notch and the overlying liver held upward. The duodenum was still further mobilized. The hepatic duct was freed from its attachment to the fistulous tract and from the remains of the common duct, the adhesions posteriorly were not otherwise disturbed, and served a very useful purpose. About three inches from the pylorus the duodenum was caught with three catgut sutures and fastened firmly to the adhesions and scar tissue about the hepatic duct, so that it was brought into contact with the end of the hepatic duct (Fig. 1). At the point of easy contact an elliptical piece of all the coats of the duodenum was excised of about the same diameter as the open end of the hepatic duct (Fig. 2), and four or five catgut sutures were introduced from the mucous side through all the coats of both duct and intestinal wall. In this way the posterior line of the anastomosis was completed. By alternately placing a suture externally and internally, the sides were built up in a similar manner to a two-row intestinal anastomosis, excepting that only the inner row penetrated the duct wall. At the upper part, the few remaining sutures were all placed before they were tied (Fig. 3). The duodenum was still further attached laterally and anteriorly to the scar tissue, covering the liver and ducts by catgut sutures, making a broad area of attachment. A drain of rolled gutta-percha tissue was placed at the upper angle of the abdominal incision and another at the lower, but each at a considerable distance from the anastomotic suture line. The abdominal incision was then closed. Time of operation, fifty minutes. Patient made an uninterrupted recovery. There

was no leakage of any kind, drains were removed on the sixth day, patient discharged on the sixteenth day. Patient re-examined ten months after the operation (March 22, 1905), had gained thirty-one pounds in weight, and was in excellent health. I would here remark that the original removal of the gall-bladder was unfortunate, as a cholecystenterostomy would have been far easier as a second operation, provided, of course, that drainage would have restored its function to a sufficient extent. Since that time we have been more conservative about the removal of the gall-bladder in connection with common duct surgery.

THE SURGICAL TREATMENT OF CHRONIC MUCOMEMBRANOUS AND ULCERATIVE COLITIS, WITH SPECIAL REFER- ENCE TO TECHNIQUE.¹

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OF OMAHA, NEBRASKA.

COLITIS of its different types is not uncommon; clinically, they are at some stages so much alike that a proper classification has not been made. The classification that I desire to assume (W. Hale White) may be summarized as follows:

1. *Chronic Primary Colitis*—by primary is meant an inflammation *not* secondary to an injury or extension from neighboring parts or secondary to some constitutional disease, such as Bright's disease. 2. *Chronic Primary Membranous Colitis*—mucous colitis. 3. *Ulcerative Colitis*—dysenteric or not. All of these have long been described in our text-books and are well known, although disputes have arisen regarding their bacteriology. We have of late years learned of other forms of colitis, clinically very similar to the above, differing only in degree and in that they are *secondary*, and all are amenable to betterment or cure through surgical treatment.

The first operation for the relief of chronic colitis was performed by Mr. Keith in 1894; the subject was a patient of Dr. Simpson's, and the case was published in the *Medical Press and Circular*, July 29, 1896.

The second case was of W. Hale White, of Guy's Hospital, operated by Mr. Golding Bird, and reported in the *Clinical Society's Transactions*, vol. xxix, 1895. Although these seem the earliest reported cases of rebellious colitis submitted to surgical treatment by right inguinal colotomy, yet I have been told that English surgeons in India were the first to per-

¹ Read before the Chicago Surgical Society, March 6, 1905.

form right inguinal colotomy for the purpose of giving rest to the colon, and that the patients they operated on were those suffering from the consequences of "Hill Diarrhoea" as well as from dysentery. Halsted, of Baltimore, was probably one of the first American surgeons to do the operation, the patient was one of Osler's. This author, in his "Practice of Medicine," 1902, says, regarding mucous and membranous colitis, "right inguinal colotomy has been performed with success in several cases of great obstinacy. The artificial anus should remain open for some time." To date, the operation has been done many times all over the world. It is rather queer to relate, however, that Boas, in his work on "Diseases of the Intestines," 1901, says, "Among the curiosities of treatment I may mention that the surgeons have attempted to cure membranous colitis by the establishment of an artificial anus. They claim to have had successful cases." In 1904, according to K. Vogel (*Münchener Med. Woch.*), Boas reports cures of ulcerative colitis by making an artificial anus in the cæcum and irrigating the colon in this way. I refer to these questions of operative treatment at this time in order to draw attention to the fact of the rather sceptical views of recognized clinicians as to the value of surgery in the treatment of rebellious colitis up to within a very recent period.

It is to John B. Deaver, of Philadelphia, that we must give the credit for directing the attention of the profession to the fact that some cases of mucomembranous colitis were caused by disease of the vermiform appendix. After reporting a typical case, he said ("Treatise on Appendicitis," 1896), "The removal of the diseased organ, which latter is probably the primary cause of these troubles, leading as it does to inadequate digestion in the large bowel, colitis, etc., or simply to malassimilation, auto-intoxication, and neurasthenia, is primarily only of utility in removing the constant danger to life by which these patients are threatened." Deaver then goes on to state that the benefits of operation are slow in their establishment. Following Deaver, George E. Shoemaker, of Philadelphia, published a paper in 1898 (*ANNALS OF SURGERY*,

1898), entitled "The Importance of Chronic Irritability of the Colon, with Mucous Stools as a Symptom of Appendicitis." This was an interesting communication and attracted wide attention. It has remained, however, for Sir William Macewen to give a scientific explanation of some of the uses of the appendix, and how an interference with its function may react upon the colon, causing inflammatory changes, mucous colitis, etc. Since Casper Bauhin discovered the ileocaecal valve in 1579, down to the present, little attention has been paid to it excepting some clinically important experiments, particularly those of Senn regarding its competence when fluids and gases were forced into the colon through the anus. Within the past two or three years, physiologists, among them T. R. Elliott and Keith, have made exhaustive studies and experiments regarding the innervation of the ileocaecal valve. It appears that "the junction of the large and small intestine is controlled by a muscular sphincter, not by a mechanical valve. Stimulation of the sympathetic nerves causes the sphincter to contract, though at the same time inhibiting the circular muscle in the wall of the ileum and colon adjoining the sphincter." Elliott, in discussing this subject, draws attention to the fact that in many animals, as, for example, the bear, hedgehog, and ferret, there is no ileocolic sphincter to enable a distinction between the small and large intestine. The human arrangement of an oblique entry of the ileum into the colon results in the formation of a valve, yet its fundamental control is by a muscular sphincter. As an example of this sphincter, in the London Hospital Museum may be found a pathological specimen of "an ulcerated colon" which exhibits a "simple evaginated sphincter without any differentiation of valves or circumferential ledges."

Macewen, in a recent address delivered at the Charing Cross Hospital Medical School, narrates some very interesting observations and experiments that he was enabled to carry out in a case of a man whose caecum had been opened and exposed, the result of an explosion. Through this wound the surgeon could see the interior of the caecum, the ileocaecal orifice, and

the mouth of the appendix; his opportunities were very similar to those of Beaumont in the St. Martin case. To briefly summarize Macewen's observations, it was noted that when food was taken into the stomach the mucous secretion of the cæcum increased, and was much augmented just before chyme began to come through the ileocæcal orifice; at one observation quite a stream flowed from the appendix. The flow through the ileocæcal valve was not continuous; the chyme coming in small quantities at a time. The cæcal and appendix secretions were invariably alkaline, the chyme coming through the valve is acid. As Pawlow has shown that the "acid reflex" of the pylorus prevents too great a flow into the intestine, there being no alkaline reflex; thus Macewen reasons that an "alkaline reflex" in the cæcum controls the flow of the acid contents of the ileum through the ileocæcal valve, to the degree that normally the contents of the cæcum may remain neutral. Whenever this reflex was interfered with, the too rapid flow of acid chyme into the cæcum and out upon the skin caused great irritability of the latter, indicating how easily normal digestion in the cæcum could be interfered with and irritation developed. Mental shock and irritability were found to very materially lessen the secretions of the appendix and cæcum. Macewen says, "The nervous mechanism of the appendix is more in keeping with that of the small intestine than of the colon; it is supplied by the terminal branches of the same group of nerves as supply the small intestine, the superior mesenteric plexus of the sympathetic. Reflex action may be easily set agoing in the appendix by stimuli from the small intestine, and each part may react on the other. When it is recollected that the circular muscles of the cæcum are continuous with those of the appendix, and that the longitudinal cæcal bands end themselves on the appendix, it will be understood how easily the nervous apparatus of the appendix may irritate the larger movements of the cæcum by first inducing movements in the appendix, and how inhibition of these movements may cause cæcal disturbance. The same agency by control of the vascular supply will regu-

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late the exudation from the appendix, and that in accordance with the impulse received from the small intestine."

Physiologists are beginning to recognize the necessarily important part that the appendix, cæcum, and ascending colon take in digestion. As early as 1813, Sir Everard Home noted that important digestion went on in the colon, but little notice has been taken of this subject. In fact, the fad of the day seems to be that the whole colon is simply a sewer canal. Acting on this theory, some surgeons have of late written in a rather depreciative way of its usefulness, and have advocated partial or complete excision rather than milder and more safe methods whenever these were possible. The glandular structure found in the appendix and colon prove beyond doubt the importance of these parts in digestion, and any abnormality of this function, whether as a cause or effect, will react. The micro-organisms always present in the appendix, cæcum, and colon, and assisting in the digestive process, may become pathogenic, and inflammatory changes result in the appendix itself or in the cæcum and colon. This interference may in the case of the appendix result in an inflammation mostly confined to that organ, an appendicitis, or else the abnormal secretion of the appendix, and perhaps cæcum also, may so interfere with the alkaline reflex of the ileocæcal sphincter that a too rapid escape of the acid chyme from this orifice into the cæcum and ascending colon will be followed by catarrhal inflammation of perhaps the entire colon. This is to me the only rational explanation of how a chronic appendicitis may bring about a mucous colitis.

Again, any abnormal position or angulation of the colon which would interfere with its digestive process may, and often does, result in some type of colitis. Downward displacements of the right kidney, dilatation of the cæcum or sigmoid resulting from adhesions or chronic constipation can and often do produce a mucous colitis, and in some rare cases ulcerative colitis and perforation.

The beautiful experiments of W. B. Cannon, of the Laboratory of Physiology, Harvard University (*American Jour-*

nal of Physiology, 1902), on the "Movements of the Intestines studied by Means of the Röntgen Rays," throw a bright light upon a hitherto little understood subject, viz., the mechanical process of digestion, and we can readily understand how, through the continuous interference with this mechanism, inflammation may result.

Briefly, for the purposes of this paper, I will avail myself of some of the observations of Cannon. If bismuth subnitrate 10 to 33 per cent. is mixed with the food, the movement of the intestinal contents, and thereby the movements of the intestinal walls, can be observed on the fluorescent screen.

Although it would be interesting to study the movements of the food through the *small intestine* as observed in the experiments of Cannon, it must suffice now to state that *antiperistalsis* was not observed, and strong evidence was obtained going to show that the statements of Grützner (*Deutsche med. Woch.*, 1894, xx, p. 897) and others as to the occurrence of this phenomenon was yet to be proved.

However, antiperistalsis was shown to be a constant factor in the digestive process in the large intestine. As the chyme enters the colon from the small bowel, it is carried by antiperistaltic waves into the cæcum, and all new food as it enters is likewise affected by these waves, and is, as Macewen has shown, mixed with the secretions of the glands of the appendix and cæcum. This chyme is not, as we have generally been taught, forced along slowly, but continuously towards the rectum. As the fluid in the cæcum travels upward it is forced backward by an antiperistaltic wave, and by a churning process becomes well mixed for the absorption of its more liquid and nourishing portions. As the contents of the large intestine move along they are met by other antiperistaltic waves. In fact, "the usual movement of the ascending and transverse colon and the cæcum is an antiperistalsis. This antiperistalsis gives a new significance to the ileocæcal valve," which by its competency prevents a back flow into the small bowel and admits of thorough mixing and absorption. As the

left portion of the transverse and descending colon are reached by their contents, peristalsis forces this onward, until by peristalsis and the pressure of the abdominal muscles evacuation occurs. One of the most interesting and, to me, important observations made by means of the X-rays was the disposition of nutrient enemata. We, at least I, have always thought that these were absorbed in the rectum and lower sigmoid, but careful observations with small and large enemata, thick and thin enemata, all of which contained bismuth, have proven that this is not the case. When small nutrient enemata are introduced, after lying in the descending colon, they are taken hold of by antiperistaltic waves, which carry them to the cæcum. The observer noted that "when large amounts are injected they stop for a moment in the region between the transverse and descending colon as if a constriction existed there. Then a considerable amount of the fluid passes the point and antiperistaltic waves carry it to the cæcum."

Absorption takes place as the waves pass, and the gradual increasing dimness of the bismuth shadows is observed, except in the descending colon; here they retain the original intensity. This proves that most absorption takes place, *i.e.*, of the liquid, above the descending colon. When the enemata were large and thin, about the consistence of cream, leakage occurred through the ileocaecal valve and the fluid passed into the small intestine. I have outlined the digestive process in the cæcum and colon in order, first, to direct attention to the manner of production of disturbances in the functions of the appendix and cæcum which may lead to a colitis; second, that we may readily comprehend how mechanical interference with both the peristalsis and antiperistalsis of the colon can result in some one of the forms of colitis. Edebohls first insisted upon the relationship between displacement of the right kidney to catarrhal appendicitis; but I believe that the recent article by P. Alylare, in the December number, 1904, of the *Revue de Chirurgie*, is of value in the same direction. In it he points out from post-mortem studies how by a descent of the right kidney the hepatic flexure is pushed down, the ligament

of Toldt binding the lower pole of the kidney and the flexure of the colon strongly together. The result being a marked angle, and in some cases narrowing in the colon at the junction of the ascending and transverse portions. Interference with the digestive functions in the cæcum and ascending colon resulting.

A few days ago, during an operation, I had an opportunity to verify this finding; a mucous colitis had developed as a consequence of the condition. It was noted, also, that the long axis of the kidney was directed downward, inward, and forward when normally the direction is downward, outward, and backward. Adhesions had formed which would not admit, even after replacement of the kidney, of the natural restoration of the position of the colon.

Lane (*Lancet*, November, 1904) has recently directed attention to the stagnation in the colon resulting from angulation following adhesions, and the cure of the disturbed colonic function by surgical methods. In order to cope successfully with the different kinds of colitis, we must in so far as possible be able to differentiate the cases and apply the surgical procedure to fit the cause. This is rather new surgery, but has a field of usefulness. Any form of colitis which had resisted careful medical treatment must be studied with a view of determining the cause and the reasons for the persistence of the cause. We may for surgical convenience recognize three kinds of colitis. First, the inflammatory due to the effect of some specific organism, an inflammatory disease commencing in, and mostly confined to, the colon. Second, an inflammatory condition secondary to an inflammation or derangement of function of the vermiform appendix. Third, an inflammation induced by mechanical interference with the peristaltic, and more especially the antiperistaltic, waves of the colon.

The surgical treatment of colitis, if carried out in recognition of these causes, will be successful. And to be successful, the type of operation must be selected with a view to meeting the pathology. It will not do nowadays to confine ourselves

in all cases to a right inguinal colotomy. This may have done for the class of cases for which it was first selected, but even in this class, which I will designate the bacteriological, the artificial valvular fistula operation suggested by Gibson, of New York, has many advantages. Not the last being the annoyance of a large open fistula and the inevitable loss of weight and strength which always follows the free external discharge of chyme as it comes direct from the ileocæcal orifice. In my experience with the appendicular forms of colitis, there are two varieties, first, and most common, the *explosive form*, which is recognized in its commencement, *i.e.*, the first few hours, by intense general abdominal pain with tenderness over the appendix. In from six to twenty-four hours dysenteric symptoms develop which may last some days, and then gradually subside or persist with moderate symptoms for several weeks. These attacks recur. The other form is of the kind described by Deaver and mentioned in the first part of my paper.

In the first kind the removal of the appendix is all that is required, as has been so in three of my cases. In the neurasthenic type of Deaver not only should the appendix be removed, but the Gibson cæcal fistula ought to be established; the long-continued interference with cæcal and colonic digestion by the abnormally functioning appendix has brought about changes in the mucosa of the colon that can only be cured by the rest and local treatment afforded through this fistula. If these simple means will not bring about a cessation of the discharges and the impaired health which always accompanies them, then something further must be done. The colon must, in greater or less part, be excluded from the process of intestinal digestion and the function established gradually by the small intestine and the remaining portion of the colon. Operations for exclusion have undergone a remarkable evolution.

Formerly, we had the old operation of Maisonneuve, which is all sufficient in the treatment of many cases of mucous colitis. But this anastomosis opening may close as in one of

my cases; just as the same thing happens after a gastro-jejunosomy when the pylorus is freely patent. Taking advantage of the experimental work of Dr. N. Senn ("Intestinal Surgery," 1888), surgeons divided the ileum close to the ileo-cæcal valve, sutured the distal end, and implanted the upper end into the sigmoid flexure or upper rectum. This usually gives practically complete rest to the colon and the colitis is cured. In some cases, however, by the process of antiperistalsis or retroperistalsis, the intestinal flow is directed backward until it reaches the cæcum and irritation develops.

Although this has not happened in three cases in which I have carried out the technique, perhaps not in two of them because I did the Gibson operation at the same time, yet it has happened, and Monprofit has shown us how to prevent the occurrence. He does what he is pleased to call "Exclusion with Drainage into the Intestine." There seems to be a rather indefinite idea of what "intestinal exclusion" really means. Elsewhere (*Medical Herald*, June, 1904) I have discussed the subject.

As M. H. Hartman (Paris) says, "the term exclusion of the intestine ought to be reserved to operations in which the continuity of the intestines is interrupted by one or two sections. The exclusion or sequestration of the intestine can be either *unilateral* or *bilateral*, and is known as the operation of Saltzer."

In *exclusion unilateral* the intestine is divided above the portion which we wish to exclude, the superior end is anastomosed or implanted into a portion of the bowel below the portion which we wish to exclude. The divided end of the section excluded is either closed or perhaps fistulized to the skin.

In *exclusion bilateral*, two divisions of the intestine are made, one above, the other below, the part excluded; the divided ends peripheral and central are anastomosed. The divided ends of the excluded portion can be closed or fistulized to the skin; or, better, they can be closed and a valvular fistula made at some suitable point in the section. In cancer,

entero-anastomosis suffices to bring about a cessation of accidents. In cases where it is indicated, exclusion is inferior to operations which definitely and immediately suppress the lesion (resection of the intestine, liberation and suture of the fistula, etc.).

Doyen and Monprofit say that if both ends of a section of the bowel be occluded, the procedure can chiefly be considered in the light of a physiological study of the secretions of the excluded bowel, but clinical experience proves that in a certain number of cases, although no fistula of the excluded section be made, nature by a process of obliteration, because of lack of function, so takes care of the excluded portion that atrophy and obliteration follow without detriment. When fistulization is employed, the fistula sometimes persists for an indefinite period. The mortality after complete exclusion without drainage, *i.e.*, the suturing together of both ends of the excluded section, or the separate suturing of each end, is greater than when the excluded part is fistulized.

According to Mikulicz, Herman, Saltzer, and others (*Handbuch der Praktischen Chirurgie*, Band iii) who have made experiments on animals, and Boracz, Von Eiselsberg, Narath, and others who have studied the subject in the human being, a section of the healthy intestine can be excluded with both ends closed without drainage and the procedure be followed by little danger. When, however, the excluded section is diseased, the secretion is increased, especially in ulcerated conditions, while the absorptive powers are diminished, this can lead to over-distention and rupture. In the sound intestine secretion and absorption are about equal, and the mucous membrane finally becomes atrophied. Therefore, unless a fistula is already in existence, Mikulicz and Kausch insist that when exclusion is made, the excluded section must be fistulized with the skin; in such conditions I would suggest the artificial valvular fistula after the method of Gibson. However, in order to overcome consequences, imminent or remote, regarding the accumulation of secretions or the persistence of fistulization in the excluded section, a surgical procedure is available.

Monprofit (*Chirurgie du Gros Intestine*) has very recently brought forward an ideal technique which he designates "exclusion with drainage into the intestine" in contradistinction to exclusion with skin fistulization. It is applicable to all possible cases, and it may be used in affections of the large intestine, the jejunum, the ileum, or even of the duodenum. It is the application of the gastro-enterostomy by double implantation, "en Y," as it is called.

In order to make the method clear, let us take a case of obstruction of the bowels due to a tumor of the ascending colon. If the ileum be divided near the cæcum, but sufficiently far away, about 20 centimetres suffice, so that the cut ends can be implanted, the lower into the sigmoid flexure of the colon, the upper into either the transverse or descending colon, the intestinal current is re-established, and the diseased excluded ascending colon is drained into the sigmoid flexure.

The theoretical objection that fluids from the excluded part of the colon would not drain through the ileocæcal valve into the stump of the ileum or into the sigmoid flexure does not hold in practice.

The pathology in the colon brings about changes in the valve which result in incompetency. Monprofit discusses the advisability of shutting off the valve by dividing the ileum close to the cæcum, suturing the valve end and then implanting the other end into the cæcum or colon near the original ileo-colonic juncture. In practice, this seems unnecessary, especially at the primary operation, and calls for too much time in addition to that required for the absolutely essential procedures. Obstructions in the colon other than those very low down in the sigmoid flexure can all be treated by intestinal exclusion with drainage, likewise obstructions of the small intestine. In suitable cases, that part of the bowel obstructed can be excised, either primarily or as a secondary operation. In a case of my own, this method of exclusion with drainage into the intestine has been followed by the happiest results.

It would seem an improvement over this method of Monprofit's, if, instead of dividing the lower ileum, it be approxi-

mated to the sigmoid and two anastomosis openings made; between these openings the ileum should be occluded by a purse-string suture, and both limbs fastened to the sigmoid so as to close any opening that might permit of a loop of intestine becoming strangulated. My personal experience in the surgical treatment of mucous membranous and ulcerative colitis is limited to eight cases, exclusive of mild catarrhs of the cæcum and appendix due to displacement of the right kidney. Four have had the Gibson operation, and two of these had in addition the ileum divided. The lower segment occluded and the upper implanted into the sigmoid. One of my operations was that after the technique of Maisonneuve. In another an ulcer of the sigmoid was excised. In one case the urgency of operation was determined by an intussusception of the lower ileum, probably resulting from the antiperistalsis in the colon.

I have had one death due entirely to too long delay and to too much zeal upon my part to correct some serious pelvic complications. The eight cases referred to were operated in the Clarkson Hospital, Omaha.

THE TREATMENT OF CONGENITAL AND AC- QUIRED LUXATIONS AT THE SHOUL- DER IN CHILDHOOD.¹

BY ROYAL WHITMAN, M.D.,

OF NEW YORK,

Associate Surgeon to the Hospital for Ruptured and Crippled.

It is of interest to note that while congenital dislocation at the hip, a misplacement present before birth, is relatively common, congenital dislocation at the shoulder in this sense is very uncommon.

In the great majority of cases, it is an acquired rather than a prenatal disability, that perhaps might be better described as a deformity of the arm than a dislocation of the humerus.

This group of cases may be divided into three classes:

1. True congenital misplacement of the humerus.
2. Dislocation caused directly by violence at birth.
3. Acquired subluxation, due to injury of the brachial plexus.

Cases of the first class are very uncommon, and are therefore relatively of little importance.

Cases in the second class are relatively uncommon also. The dislocation in these cases is apparently caused by traction on the arm at delivery, or by swinging the child by the arms in attempts at resuscitation. In most instances there is injury to the brachial plexus as well.

In the third, and numerically by far the most important class, there is no primary displacement, and the subluxation found in later years can be classed as congenital only in the sense that it is induced by injury at birth.

The sequence is somewhat as follows. In cases of obstetrical paralysis, the injury to the brachial plexus caused by trac-

¹ Read before the New York Surgical Society, March 8, 1905.

tion, and pressure on the neck, ordinarily involves the fifth and sixth roots. The characteristic paralysis therefore is of the deltoid, the biceps, and the supinators of the forearm; thus the arm hangs by the side in an attitude of inward rotation and pronation. During the period of repair, extending over several months, and which is often incomplete, accommodative retraction and contraction of the tissues take place that prevent resumption of normal attitudes when recovery is complete, and which favor greater disability if the injury to the nerves is irremediable.

In cases of obstetrical paralysis seen soon after birth, it may be noted that the tissues at the seat of the injury are often sensitive to pressure; there may be swelling at the shoulder, and passive motion of the arm causes evident discomfort. These symptoms of direct injury gradually subside; but if, meantime, the arm has been allowed to hang by the side unsupported, a very decided resistance is apparent when one attempts to rotate the humerus outward or to abduct it, even during the early months of infancy.

There is a very general impression that spontaneous recovery is the rule after obstetrical paralysis, consequently, systematic treatment for the purpose of preventing deformity is not usually employed; and, although the original helplessness gradually lessens, the comparative disability may become more marked with development.

In a characteristic case of this type, the habitual pronation of the hand and the awkwardness of the arm are very noticeable. Usually, the extremity is smaller and shorter than its fellow. The humerus is somewhat abducted on the scapula; its upper extremity projects behind and below its normal position, and there is a corresponding flattening of the tissues on the front of the joint. The deltoid is usually completely atrophied, and there is practically ankylosis at the articulation. In many instances the power of flexion of the forearm has been regained, and that of the supinators also; but this cannot be properly exercised because of the restriction of motion at the shoulder.

In these cases the deformity and disability of the arm are much more noticeable than the displacement of the humerus; but this displacement and the other restrictions to normal motion that accompany it, although secondary to the paralysis, have become of greater importance than the original lesion, since they prevent functional use, and are thus in great degree accountable for the loss of growth and the comparative uselessness of the extremity.

If the displacement of the humerus is complete, or more extreme than might be accounted for by development in the attitude of deformity, one may conclude that the dislocation and the paralysis were each the direct effect of injury at birth. In such cases the prognosis is of course much more favorable than in the preceding class. Finally, if an actual dislocation is present without history of injury or of paralysis, it may be classed as truly congenital.

In all cases of this character of whatever class, the first indication is to reduce the deformity. In cases of the third class, which, as has been stated, are by far the most common, the ultimate purpose of treatment is to overcome the inward rotation of the humerus so that the power of supination of the forearm may be utilized. In this, as in all other disabilities secondary to paralysis, the actual degree of irremediable injury to the nervous apparatus cannot be estimated until deformity and restriction of motion have been overcome. In many instances, partial, or even complete, recovery from the original paralysis may have taken place, and yet there has been no return of function because of the restraint exercised by secondary contractions and adhesions. Thus, in certain cases of this character, practical functional cure may be attained when these obstacles are removed. I mention this point particularly, in order that it may not be assumed that I regard correction of deformity as a treatment of paralysis other than in the manner indicated.

It was at one time generally believed that a large proportion of these cases were truly congenital, and that there were accompanying developmental defects that would prevent repo-

sition. Thus the treatment originally advocated by Phelps was to open the joint on the posterior aspect, and to cut away sufficient of the head of the humerus to accommodate it to the contracted capsule. It seems more rational, however, from the point of view that I have indicated, to increase the capacity of the joint rather than further diminish the size of the already atrophied head of the humerus. Afterwards, one must assure the improved position by fixing the parts for a sufficient time to permit readjustment of the tissues. In other words, the treatment should be similar to that of bloodless reduction at the hip-joint.

The child, having been anæsthetized, is brought to the edge of the table. The shoulder is grasped firmly with one hand in order to restrain the movements of the scapula, and with the other the arm is drawn upward and backward over the fulcrum of the thumb, which lies behind the joint. This, the so-called pump-handle movement, alternately relaxing and stretching the contracted parts, is carried out over and over again with slowly increasing force, the aim being to force the head of the bone forward, and thus to overcome the resistance of the anterior part of the capsule. When this has been accomplished, there is a distinct depression behind, and the head of the humerus projects in front, at a point below its proper position.

One then attempts to overcome the abduction and to force the head upward by changing the grasp on the scapula and using the thumb in the axilla as a fulcrum. When the arm can be carried across the chest to the normal degree of adduction, the final, and often most difficult, part of the process, namely, to stretch the tissues sufficiently to permit the proper degree of outward rotation, is undertaken. This is best accomplished by flexing the forearm and using this to exert leverage on the humerus, care being taken, of course, to avoid the danger of fracture. When the head of the bone has been replaced, it will often be noted that the tension on the anterior tissues causes flexion of the forearm; this must be overcome in the same manner, and, finally, the limitation to complete supina-

tion. The extremity is then fixed in the over-corrected attitude by means of a plaster bandage which includes the thorax. That is, the arm is drawn backward so that the head of the humerus is made prominent anteriorly, the forearm is flexed and turned outward to the frontal plane, while the hand is placed in extreme supination, the arm lying against the thoracic wall.

In the more extreme cases it is impracticable to complete the operation at one sitting. When, therefore, as much force has been exercised as seems wise, a plaster bandage is applied, and after an interval of two weeks the further correction is undertaken.

As has been stated, when the head of the bone is forced forward, a distinct depression and evident relaxation of the tissues is noted on the posterior aspect of the joint. The object of the fixation is to allow the contraction of the posterior wall of the capsule and the obliteration of the old articulation, consequently, the part must be fixed for a period of at least three months. When the plaster bandage is removed, the after-treatment is of great importance. This consists of daily passive forcible movements to the extreme limits in the directions formerly restricted; namely, outward rotation, backward extension, and eventually abduction of the humerus and supination and extension of the forearm. For in all these cases there is a strong tendency to a return in some degree to the original posture. When motion has become fairly free, the disabled member must be regularly exercised and re-educated in functional use. Under this treatment the weakened and almost completely atrophied muscles usually gain surprisingly in power and ability, and the longer it is continued the better will be the final result. If the deltoid muscle is completely paralyzed, one cannot expect independent movement at the shoulder, and the aim should be to gain fibrous ankylosis in the attitude of outward rotation in order to permit supination of the forearm.

To recapitulate: The essentials of successful treatment of this difficult class of cases are complete overcorrection at



FIG. 1.—The characteristic attitude of obstetrical paralysis, an attitude that causes deformity.



FIG. 2.—Subluxation of the humerus, showing the prominence of the head behind and below its normal position, and its effect upon its attitude, particularly in causing persistent supination.



FIG. 3.—The same patient eight months after treatment, showing the range of abduction and the gain in muscular development.

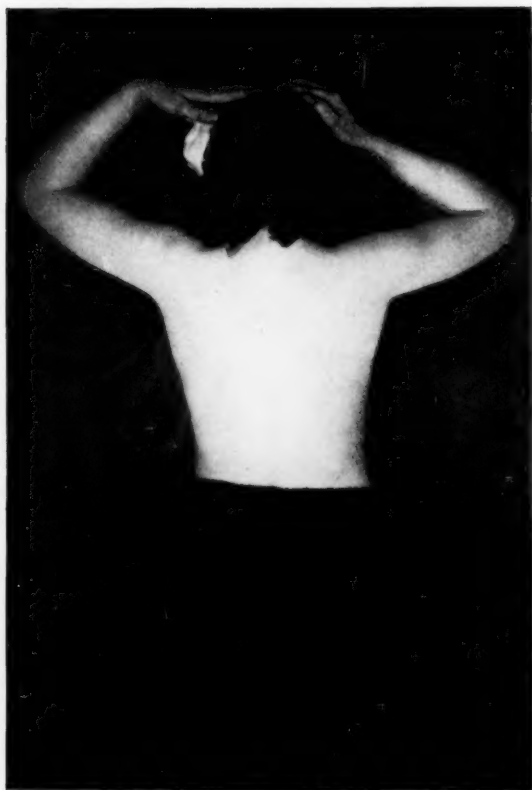


FIG. 4.—A case similar to that shown in Fig. 2 illustrating the improvement induced by exercise in a period of about eighteen months after operation.

the time of operation; fixation for a sufficient time to assure the stability of the new articulation by accommodative changes within and without the joint, and the persistent after-treatment, as has been described.

Although this paper is concerned primarily with displacements at the shoulder, there are other points of interest that may be mentioned briefly. For example, it is evident that this, in many instances, is one of the unnecessary deformities that might be prevented by support and by methodical passive motion of the arm during the stage of primary paralysis caused by injury at birth, or by the immediate replacement of a dislocation induced by violence at that time. It is evident, also, that this treatment should always precede the operation of nerve grafting, or other operation on the brachial plexus, for even complete restoration of the nerve supply would be of little use if function were restrained by deformity.

Finally, attention may be called to the fact that there is another class of cases in which the injury to the brachial plexus has been more severe, and in which the resulting paralysis is wide-spread. There is, as a rule, no displacement or other deformity at the shoulder, the appearance being one of helplessness rather than of contraction. In such cases other operations, such as tendon transplantation and arthrodesis, if supplemented by support, may make the useless member serviceable.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 8, 1905.

The President, HOWARD LILIENTHAL, M.D., in the Chair.

PYLORECTOMY FOR CARCINOMA.

DR. CHARLES L. GIBSON presented a man, fifty-three years old, who entered St. Luke's Hospital on November 28, 1904. For a number of years past he had suffered from gastric and intestinal disturbance, but his serious trouble began about a year ago. He then first complained of severe gastric pain, increased by taking food; he had frequent attacks of vomiting, and he lost flesh and strength.

An examination failed to reveal any physical signs. There was no tumor in the region of the stomach. On examination of the stomach contents, free hydrochloric acid was present, and the result rather militated against the diagnosis of carcinoma. In spite of this, an exploratory laparotomy was decided on, and a good-sized tumor involving the pylorus and lesser curvature of the stomach was found. A wide resection was done by the usual method, embracing practically one-half of the stomach, and the operation was completed by doing a posterior gastro-enterostomy.

The patient's convalescence was fairly uneventful. His temperature never went above 101° F., and he left for his home on the twenty-seventh day after the operation. His weight had increased from 116 to 145 pounds, which was the most he had ever weighed in his life. The pathological examination of the tumor proved it to be a carcinoma.

Dr. Gibson said he had showed this case to particularly emphasize the fact that in some instances of this kind an operation should be undertaken more or less tentatively, without waiting for the classical signs of carcinoma.

DR. F. KAMMERER said that in operating on cases of tumor of the stomach, it was frequently a difficult matter to decide whether to remove the pylorus or not. He recalled three cases in which the tumor at the pylorus was evidently benign, although presenting the gross appearance of cancerous growths, and was not removed. In one of these the speaker said he had occasion to reopen the abdomen seven weeks after the primary operation, and he then found that the tumor had entirely disappeared. The question that had to be decided in dealing with these cases was whether to do a resection or a simple gastro-enterostomy, or some other plastic operation on the pylorus. Pylorectomy was certainly a much more severe operation than either the Finney operation or a gastro-enterostomy.

Dr. Kammerer said that the absence of free hydrochloric acid in the stomach contents could not always be relied upon, and he agreed with Dr. Gibson that an operation was advisable, even in doubtful cases. During the past few months he had operated on five cases of benign tumor of the pylorus. In some of those cases the symptoms were indefinite, pointing to a chronic ulcer of the stomach, with pyloric stenosis. In all of them very marked changes at the pylorus were found.

DR. HOWARD LILIENTHAL emphasized the importance of thorough and repeated examination of the stomach contents in doubtful cases. At least half a dozen examinations should be made, and these would oftentimes show surprising variations in the percentage of free hydrochloric acid, ranging from a normal quantity to its entire absence. Dr. Lilienthal thought that all doubtful cases of tumor of the stomach should be looked upon as malignant, and treated accordingly. A palliative operation done in a malignant case was a calamity if a radical operation could possibly have been done instead.

DR. GIBSON, in closing, said the surgeon was often led astray by the report of the examination of the stomach contents, and he suggested that improvement along that line of clinical investigation would be of great benefit in the diagnosis of obscure gastric lesions.

TUBERCULOSIS OF THE OLECRANON BURSA.

DR. GIBSON presented a woman, forty-three years old, who noticed a lump in the region of the olecranon fossa of the left arm about four years ago. There was no history of traumatism. The mass gradually became larger, until it extended half-way down the forearm. Upon incision, it proved to be a tuberculous process of the superficial bursa of the olecranon. It was removed without difficulty, and the patient made an uneventful recovery.

TUBERCULOSIS OF THE BREAST.

DR. GIBSON also showed a tubercular tumor of the breast which was removed under the supposition that it was an adenofibroma.

SUBDIAPHRAGMATIC ABSCESS.

DR. JOHN A. HARTWELL presented a woman, forty-eight years old, married, who was admitted to the Lincoln Hospital on May 19, 1903, with the history that for seven months prior to her admission she had suffered from pain in the right hypochondrium and the anterior lumbar region. Nothing more definite regarding her previous history could be elicited.

Examination showed a rather poorly nourished woman, who apparently had undergone a good deal of suffering. The thoracic viscera were normal. Abdominal examination revealed considerable tenderness in the right hypochondriac and lumbar regions, and a movable tumor just above the iliac spine which gave the characteristics of a movable kidney. The appendicular region was also tender. The patient's temperature ranged between 100° and 102.5° F.; the pulse between 100 and 120, and the respirations between 24 and 28. The pain persisted, with varying severity.

May 21, 1903, an exploratory incision was made through the middle of the right rectus, because neither the movable kidney nor the appendix seemed to account for the symptoms present. The movable tumor proved to be a kidney. There were many adhesions in the neighborhood of the gall-bladder and the transverse fissure of the liver, and a lesser number around the appendix. There were no indications, however, of a cholecystitis or an abscess in this region. The adhesions were broken up, and

the structures about the subhepatic region were freed. The appendix was then removed, and the laparotomy wound closed. The movable kidney was then anchored through a posterior incision, after the technique advocated by Edebohls. Pathologically, the appendix showed a mild grade of chronic inflammation of the mucous membrane.

The patient's symptoms were entirely relieved during the first five days following the operation, the temperature and pulse having both fallen to normal and remained so.

On the fifth day the patient's temperature again rose to 100.5° F., and this was repeated during the following two weeks, at intervals of twenty-four or forty-eight hours. In the meantime, both wounds had healed primarily. On the tenth day the temperature reached 102° F., and there developed râles over the lower right chest. The patient was gradually losing flesh and strength. A diagnosis of tuberculosis, probably pulmonary, was made, and on the twenty-sixth day after the operation she returned to her home in rather poorer condition than she was at the time of her admission.

During the three weeks that she remained at home, her irregular fever persisted, and the emaciation progressed. There was also present more or less constant pain, similar to that complained of prior to the operation. Her attending physician, Dr. Francis A. Auleta, examined her from time to time, and finally, on July 1, found signs of fluid in the right posterior chest, low down, and an exploratory puncture through the ninth intercostal space in the posterior axillary line withdrew pus.

The patient was readmitted to the hospital on July 2, 1903, and operated on the same day. An incision was made over the ninth rib, just anterior to the angle of the scapula. About an inch and a half of the rib were resected, exposing the pleura. The pleural cavity was closed by stitching the two layers together with catgut, with gauze packed around it. An incision was then made through the two pleural layers and the diaphragm, exposing the postero-superior border of the liver. The œdema and fibrous exudate in this region indicated the near presence of pus, and, by palpating the liver, fluctuation was obtained. An incision was made into the presenting surface of the liver, and a blunt instrument inserted, which resulted in a flow of thin, grayish pus. This opening was then enlarged, and almost a quart of pus evacu-

ated. The site of the abscess was not definitely determined, but it seemed to be under the liver rather than in it, the puncture apparently passing through the organ near its posterior border.

The kidney that had been operated on could be palpated through the wound, and was firmly fixed in the position in which it had been anchored.

The wound was packed and drained. Recovery was prompt and uninterrupted, the cavity filling entirely in about five weeks, when the patient was discharged. Since then she had remained in excellent health. The pleura did not become infected at any time. The case was interesting because of the unexplained cause of the abscess, and because of the apparent improvement after the first operation, which failed to locate the trouble.

CHOLECYSTECTOMY FOR GALL-STONES.

DR. HARTWELL presented a woman, twenty-six years old, who was admitted to the Lincoln Hospital on May 10, 1904, suffering from cholelithiasis, with the following history: With the exception of a mild attack of what may have been biliary colic five years ago, she had always enjoyed excellent health. She had never had any acute sickness, and her menstrual and maternal life had been absolutely normal, having had one child and no miscarriages. Her digestion and nutrition had always been good.

Five weeks prior to admission, she was suddenly seized with intense epigastric pain, which subsequently extended over the right hypochondrium. Violent vomiting, sweating, and marked prostration accompanied the pain. The latter she described as being a "tearing or crushing pain" over the lower costal arches. There was no change in the color or character of the stools or urine. The attack continued two days, and could only be controlled by anodynes. No jaundice appeared then or later. From that day to the time of her admission she had never been free from pain in the right hypochondrium, and the acute attacks occurred at frequent intervals, from a few hours to two days. There was no relation between the taking of food and the attacks of pain. Sometimes the latter would radiate to the right shoulder. No calculi were ever seen in the stools. Since the onset of her attack she had lost about twenty pounds.

On admission, the following notes were made regarding her physical condition: There was marked adiposity; no jaundice; the thoracic viscera were normal; the abdomen showed distinct tenderness and rigidity over the region of the gall-bladder for an area about four inches in diameter. On account of the abundance of fat in the abdominal wall, no distinct tumor could be felt. The patient's temperature was 102° F.; pulse, 120. The leucocyte count was 15,000. The urine had a specific gravity of 1030; it was acid in reaction, amber in color, contained a cloud of albumen and granular and hyaline casts.

Operation, May 11, 1904. The gall-bladder was found much distended, adherent, and thickened. In breaking the adhesions the bladder ruptured, and an enormous number of sand calculi, with purulent bile, were discharged into the wound. The largest was the size of a buck-shot, and the smallest less than the size of a pin-head. The ducts, on palpation, showed no stones present. The cystic duct was not ligated because it tore away from the suture and was not again found. The gall-bladder, after its removal, was widely opened, and a count showed something over 1200 calculi present, with an estimated total of about 1500. The largest was the size of a small pea.

The patient's convalescence was uninterrupted, the sinus closing in about six weeks, the free flow of bile during the first two weeks demonstrating the patency of the cystic duct.

DR. LILIENTHAL said that in dealing with very large gall-bladders, he thought it safer, as a matter of technique, to empty them before extirpating them. By following this method, one would be less apt to cause rupture. As to the tearing out of a suture, the speaker said he had never seen it happen when it was passed through the walls of the cystic duct. In Dr. Hartwell's case, the duct was apparently exceptionally tender.

In reply to a question, Dr. Lilienthal said he did not consider it particularly dangerous to have the gall-bladder rupture during an operation; still, he preferred to avoid that accident, if possible. The speaker said he could easily conceive of a case in which stones of considerable size might happen to be lost in the abdominal cavity and decidedly interfere with the healing process.

RESECTION OF STOMACH FOR CARCINOMA.

DR. WILLY MEYER presented a specimen obtained from a woman, forty-eight years old, who was admitted to the German Hospital early in November, 1904. For two months previous to that time her health had been gradually declining. An examination showed that the stomach was evidently much enlarged, and, after more than thirty minutes' lavage, particles of food taken several days before were still ejected. A distinctly movable tumor could be made out, lying principally to the right of the xiphoid cartilage.

The abdomen was opened on November 10, 1904, and a tumor was found involving the pylorus and at least half of the upper portion of the duodenum, and projecting into the lumen of the stomach. There were many enlarged glands below the greater curvature. The stomach was divided between two Kocher clamps, and the cut borders wiped with lysol solution. The portion of the stomach to be resected was surrounded with gauze, and turned towards the right side of the patient. The cardinal portion of the stomach was now closed in the usual way. A small duodenal clamp was then applied at the distal end of the tumor, and an intestinal compression clamp next to it, as low as possible. The latter clamp having been removed, the gut was surrounded with a silk ligature and divided above it, and its cut end provided with a purse-string suture. Before this was tied, the assistant accidentally withdrew the silk ligature from the gut, allowing some of the duodenal contents to escape. After thoroughly cleansing the wound, the cut surfaces of the gut were inverted and closed by two rows of interrupted silk. The head of the pancreas was conveniently near, and, following his usual custom in these cases, Dr. Meyer made use of it by stitching it over the line of suture. A posterior gastro-enterostomy was then done with Murphy's button, and, on account of the protruding mucous membrane, three additional interrupted silk sutures were inserted. After these had been placed, as the gut seemed to be kinked a good deal at the point of anastomosis, the efferent part was stitched to the stomach wall with a few sutures. Finally, the omentum was turned up and stitched over the pancreas and the divided duodenum. With the exception of some symptoms pointing to intestinal obstruction, which were relieved

by the passage of the button on the eighteenth day, the patient made an uneventful recovery. At present she is in perfect health.

SACCULATED POPLITEAL ANEURISM; MATAS'S
OPERATION.

DR. WILLY MEYER reported a case of Matas's operation for popliteal aneurism, with remarks upon the procedure.

BILATERAL CERVICAL RIB; CONGENITAL TORTICOLLIS;
SPINAL CURVATURE AND MENINGOCELE.

DR. ROYAL WHITMAN presented a boy, ten years of age, with a cervical rib on each side, associated with extreme congenital torticollis, spinal curvature, and a meningocele on the back of the head. The torticollis had been improved by a division of the muscles a year ago, and, although a facial atrophy was extreme, the improvement was marked. The most significant sign of cervical ribs was broadening of the base of the neck and the abnormal resistance to labial pressure in this region.

DISLOCATION OF THE SHOULDER-JOINT.

DR. WHITMAN presented a girl, eight years old, who probably, as the result of injury at birth, sustained a dislocation at the right shoulder, with accompanying obstetrical paralysis. When Dr. Whitman first saw her last August, the arm was turned inward, the forearm was pronated, and function was very poor. The luxation of the humerus was reduced, and the child now has good use of the arm. With proper and regular exercises, Dr. Whitman said, perfect function of the limb should be restored.

THE TREATMENT OF CONGENITAL AND ACQUIRED
LUXATIONS AT THE SHOULDER IN CHILDHOOD.

DR. ROYAL WHITMAN read a paper with the above title, for which see page 110.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, March 6, 1905.

The President, HENRY R. WHARTON, M.D., in the Chair.

THE MATAS OPERATION FOR THE CURE OF ANEURISM.

DR. JOHN H. GIBBON presented a negro man, thirty-one years of age, whom he had subjected to the Matas operation for the cure of a popliteal aneurism. He stated that he believed this operation was as great an advance over the older ones as that of the Bassini operation for hernia is over its predecessors. The operation of Matas had been recently and completely described by the author in the *ANNALS OF SURGERY* for February, 1903. The possibility of performing this operation was suggested to Matas by the fact that the lining membrane of the aneurismal sac is the same as that of the vessel itself, and by the good results which have been obtained where arterorrhaphy has been practised.

In the case of sacciform aneurism where the sac is evacuated and the opening into the artery sutured without interference with the circulation, there can be no comparison between this operation and ligation. And even in fusiform aneurisms the advantages of this new method over the older one of ligation are paramount. Dr. Gibbon knew of no instance where the suggestion of Matas that it might be possible to reconstruct the artery by utilizing a portion of the sac in fusiform aneurisms had been done, but the method certainly seems worthy of trial. One of the greatest advantages in closing the arterial openings within the sac of an aneurism is the fact that the collateral circulation is not interfered with in the least possible way.

The Matas operation is applicable to all aneurisms in which there is a distinct sac, and in which the cardiac end of the main vessel can be thoroughly controlled.

The case reported by Dr. Gibbon was admitted to the Pennsylvania Hospital on October 27, 1904. At the time of his admission the aneurism was about the size of two fists, and could easily be seen projecting beyond the normal line of the leg on each side. The leg and foot were so enormously swollen as to resemble a marked elephantiasis. The patient said that he had been struck on the back of the leg eight or nine months previous, and he attributed the development of the aneurism to this injury; he denied syphilitic infection. A positive diagnosis of aneurism of the popliteal artery was made without difficulty, as all the typical signs were present. After two days' rest in bed the œdema of the leg greatly decreased, but no pulsation was ever detected in either the anterior or posterior tibials. Two days after admission, after elevation of the leg and the application of an Es-march constrictor well up on the thigh, a long incision in the middle of the popliteal space over the aneurism was made. The sac was laid freely open from end to end and a quantity of liquid blood and clot in various stages of organization was evacuated. At the upper and lower part of the sac could be demonstrated the opening of the vessel. Dr. Gibbon thought for awhile that it was a sacciform aneurism, as he could not find the point of exit of the artery; but finally he was able to do so near the upper part of the lower end of the sac; in other words, the sac had developed posteriorly and extended under the inner head of the gastrocnemius. It was impossible, because of the shape of the sac, to re-establish the caliber of the vessel, and Dr. Gibbon therefore followed Matas's plan of closing the openings of the artery with a small chromicized suture carried on an ordinary curved intestinal needle. No openings of collateral vessels in the sac were found, and therefore the constrictor was loosened; as there was no bleeding even after this was done, he thoroughly cleansed the sac, rubbing its interior with weak bichloride solution followed with salt solution. The sac was then entirely obliterated with repeated rows of chromicized gut sutures. There was considerable oozing from the cut edges of the sac, but this was controlled by a whipstitch. The skin was closed entirely and a dressing applied. The patient did well after the operation, but on the second day his temperature rose to 103° F., and he complained of considerable pain in the leg; as he had had some tem-

perature before the operation, it was not thought that this was due to infection; but this was an erroneous idea, as within a few days there was evidence of infection of the wound. The stitches of the skin were removed and a large quantity of pus evacuated, afterwards the temperature fell and the patient was much more comfortable. The circulation remained good in the foot. Some days after the operation there developed a necrotic area about the size of a silver dollar on the heel, which was undoubtedly due to pressure, which should have been avoided. This is now practically well, but has given the patient more trouble than the popliteal wound. There was considerable contraction of the leg after removal of the splint, but he is now able to extend it to nearly a normal degree. There still remains an irritated scar in the popliteal region, which is probably due to the want of care which the patient has given it since he left the hospital. During his convalescence he took very large quantities of potassium iodide with impunity, and he is now taking 30 grains three times a day. There is no evidence of a redevelopment of the aneurism.

It was stated that in a number of other cases which have been reported an infection of the wound had taken place, but in none of them has it interfered with the cure of the aneurism. The fact that suppuration seems to be frequently in these cases would lead Dr. Gibbon in another case to insert a superficial gauze drain not into the sac, but down to it.

SUTURE OF FEMORAL ARTERY.

DR. FRANCIS T. STEWART gave the details of a case of suture of the femoral artery. The patient was a young, robust man, whose femoral artery had been injured by a flying piece of steel, with the resulting formation of a large traumatic aneurism. At the operation, instead of applying a tourniquet, an incision was made directly over the sac and hæmorrhage from the vessel controlled from the wound. The sac was opened and the communication with the vessel sutured. There were no untoward post-operative effects, suppuration not occurring. The leg was kept elevated for two weeks. Pulsation in the artery was immediately restored and continued until the patient left the hospital. In answer to a question by Dr. Gibbon, Dr. Stewart said the length of time between the injury and the operation was about eight days.

VARICOSE VEINS SIMULATING FEMORAL HERNIA; OPERATION; DEATH ON THE SEVENTH DAY FROM HEART-CLOT OF UNCERTAIN ORIGIN.

DR. WILLIAM J. TAYLOR reported the case of a young woman, aged thirty years, who consulted him first on May 21, 1904, stating that she had been ruptured, and had tried to wear a truss, but this had given her so much discomfort and uneasiness that she was unable to wear it. At the same time she complained of quite extensive varicose veins of the left leg and thigh. He found a swelling over the left saphenous opening which had every appearance of being a femoral hernia. This swelling was soft, and could be readily reduced with slight pressure; there was some impulse on coughing, and when she lay down the whole mass disappeared. In view of this history the conclusion was natural that she had a femoral hernia which could not be properly retained by a truss, and that the pressure of the truss was producing the varicose veins.

On May 25 he operated at the Orthopædic Hospital, and, upon cutting down upon the mass, found it to be an enormous varicose condition of the saphenous vein. The whole vein below this point was thickened and indurated, and she had evidently had a venous inflammation extending down the whole leg. There was no hernia. The mass felt was this varicose condition of the saphenous vein. He ligated the vein below the enlargement, very carefully emptying the vein, and then ligated it about three-quarters of an inch from the femoral vein. He ligated it also once in the centre. She did very well for three days, when she complained of a great deal of pain in the stomach and abdomen. Now, on carefully examining her, was elicited a very good history of gastric ulcer, extending back over several years, and particularly during the past year. Dr. Morris J. Lewis was asked to see her, and he agreed in the diagnosis. Nitrate of silver and opium were given, and she was fed entirely by the rectum. All this time the wound was doing perfectly well; the drainage had been taken out, and it was practically healed. She improved markedly, and at once after the rectal feeding was begun; but about half-past two, on June 2, she called out to one of the women in the ward that she was fainting. The head nurse saw her almost immediately, and found her in a condition

of collapse, blue, and in an excruciating agony. Dr. Taylor saw her himself within ten minutes of this seizure, and found her in a most distressing condition, although she had somewhat revived. The pulse was very rapid, and practically imperceptible at the wrist; she was blue about the lips, in profound collapse, and with intense pain in the region of the stomach. The first impression was that a gastric ulcer had perforated. She was given hypodermics of salt solution with adrenaline added to it, hypodermics of atropine, digitalin, and inhalations of oxygen. Dr. Lewis saw her later at half-past three. There was no abdominal rigidity, and, in view of this fact, it was concluded that the condition was one of heart-clot. She lingered on until Saturday, the 4th, at eleven o'clock, when she had a second collapse and died. During this whole time her pulse was always above 120, often 160, and she was kept alive simply by rectal stimulants, hypodermics, and oxygen. At no time was her general condition such that any surgical operation could have been attempted.

Post-Mortem.—Post-mortem examination was made by Dr. D. J. McCarthy. The examination, in brief, showed that she had a hæmorrhagic pericarditis and a clot in the auricle of the heart of the right side, which was dilated, and some myocarditis. There were no clots in either ventricle. The stomach showed an acute gastritis, evidently following upon an old and chronic condition, as there were two healed gastric ulcers, chronic gastritis at the pyloric, and acute gastritis at the cardiac end. The stomach was smaller than normal. The site of the wound was examined with care. The wound was entirely healed; there was no evidence of infection or of any untoward result; in fact, the wound was entirely well; but there was a small blood-clot removed from the left iliac vein just below the common iliac. The saphenous and femoral veins were normal. The etherization may have been a factor in producing excitement, which, added to her gastric condition, may account for the heart-clot.

DR. JOHN B. ROBERTS recalled an instance of unexpected death from a gastric condition not known to exist. Suprapubic operation for vesical calculus had been performed, and the patient was doing nicely, when abdominal pain developed and was shortly followed by death. Autopsy revealed a large gastric ulcer with cicatrized edges, perforation of which had caused the fatal peritonitis. There had been no symptoms of gastric ulcer,

and that condition was not suspected. The case, then, was one in which an operation wound was doing well, yet the patient suddenly died. A second case illustrates another point in Dr. Taylor's paper, that of mistaken diagnosis. Six or eight years ago Dr. Roberts operated upon a woman who, from the history and symptoms, was suffering from appendicitis. When the appendix was exposed it appeared perfectly normal, and, as it then was not customary to remove such appendices, the organ was allowed to remain. The patient recovered from the operation and was soon going home, when she sat up in bed and died instantly. Autopsy revealed fatty degeneration of the heart and kidney disease, although the urine had been reported as essentially normal. Cases of this nature belong to what have been termed the calamities of surgery. The patient died, although she did not have appendicitis as suspected. In such cases the friends, of course, attribute death to the operation, and thus make these occurrences doubly disagreeable to the surgeon.

PERFORATED GASTRIC ULCER.

DR. CHARLES F. MITCHELL exhibited a specimen of perforated gastric ulcer recently obtained at autopsy upon a patient whom operation had failed to relieve. The patient was a motor-man, and was seen two hours after admission to the Pennsylvania Hospital. Two days previously he had been seized with sudden abdominal pain and fainted. The family physician sent the man to the hospital. There a diagnosis of peritonitis was made, and, because of the previous history of gastric catarrh, the origin was believed to be a perforated gastric ulcer; the entire abdomen was tender and rigid. Incision in the median line above the umbilicus was followed by escape of fluid under tension and the bulging of the omentum. Examination of the stomach showed a large opening in the anterior wall at a point supposed to be near the cardiac end. The stomach could not be drawn from the wound, and sutures introduced to close the perforation immediately pulled out. The man was in a desperate condition, so the lesion was packed off as well as possible and the abdomen washed out. The patient lived four days. At autopsy, two perforations of the stomach were found. The first, supposed to have been near the cardiac end, was near the middle of the anterior wall of the stomach, between the greater and lesser curvatures,

and the second in the greater curvature, and adherent to the pancreas.

CYST OF THE PANCREAS.

DR. R. P. McREYNOLDS presented a woman forty-nine years of age, who had been subjected by him to partial excision and drainage of a pancreatic cyst. The history was as follows: The woman had borne twelve children. Normal menstrual history. No inflammatory diseases of the pelvic organs. Two years ago, slight soreness in abdomen was first noted. Gradual enlargement of abdomen ensued, and finally prompted her to consult her family physician, Dr. Mitchell, who sent her to hospital, where she came under the care of Dr. McReynolds. She presented a tense, fluctuating tumor, which filled nearly the whole abdomen, which was symmetrically enlarged to the size of a full-term pregnancy. When the abdomen was opened, November 8, 1904, the omentum was found adherent to a large cyst sac which apparently filled the greater part of the peritoneal cavity. After the removal of eight or ten quarts of dark chocolate fluid from the cyst, the sac was partially drawn out through the abdominal wound, but its entire enucleation was found impossible on account of numerous adhesions, especially to the liver. Part of the sac having been cut away, the remains were stitched in the abdominal wound and its cavity packed with gauze and with rubber drainage-tubes. Though but little blood was lost, the shock manifested by the patient was very marked. From this, however, she was soon rallied, and she made thereafter an uneventful recovery. It was apparent at the time of the operation that the cyst had grown up between the stomach and transverse colon; the colon had been pushed down as far as the fibres. The fluid collected at the dressing the day after the operation showed the presence of pancreatic ferments.

DR. W. W. KEEN approved Dr. McReynolds's condemnation of puncture of the abdominal wall in order to get fluid for diagnostic purposes; this expedient is fraught with too great danger of perforating the stomach or colon. Dr. Keen was one of the first surgeons in this country to operate upon a case of pancreatic cyst. The patient was a girl of fifteen. The cyst was the size of a head and presented in the epigastrium. Good recovery followed operation by essentially the same method as detailed by

Dr. McReynolds. Dr. Keen believes that in very few cases is extirpation of the cyst justifiable.

DR. GEORGE ERETY SHOEMAKER saw a case of pancreatic cyst twelve or fifteen years ago in dispensary practice. The patient was a woman of twenty, who had a tumor eight or ten inches in diameter presenting in the centre of the abdomen. The diagnosis of ovarian cyst was made, but the patient refused operation. Later she went to the University Hospital, where she was operated upon by the late Dr. Goodell, who found a cyst of the pancreas. The two layers of peritoneum and the cyst wall were stitched to the abdominal incision, and the patient made a good recovery.

DR. JOHN H. GIBBON spoke of a case of pancreatic cyst under his care in the Pennsylvania Hospital fourteen months ago. The patient was a colored man who had been kicked in the abdomen three days before admission. There was no evidence of peritonitis or of any profuse hæmorrhage. At the time of admission he complained of pain in the left loin, and there was a distinct tumor in the left renal region. The day after admission this tumor had greatly increased in size, fluctuated, and was somewhat tender. During the previous twenty-four hours the patient had passed but fourteen ounces of urine. The tumor was flat on percussion and the colon was internal to it. Diagnosis was made of hydronephrosis and operation advised. An incision was made exposing the left kidney, which was perfectly normal. In front of the kidney, however, could be felt the fluctuating mass, which was thought to be within the abdominal cavity. The patient was therefore turned on his back and an incision made in the upper portion of the left semilunaris. The abdominal cavity was found normal, excepting for some thickening of the gastrocolic omentum. The stomach was pushed forward by the tumor. The lesser peritoneal cavity was opened through the gastrocolic omentum, and a large cyst extending far over into the left side of the abdomen discovered. The cyst contents were evacuated and the cyst walls sutured to the peritoneal edges. The cyst contained a large amount of bloody fluid, which, on being afterwards examined, was found to possess the characteristics of pancreatic juice. It was thought in this case that the man had probably had a cyst of the tail of the pancreas, which had given him no trouble until he received the blow in

the abdomen, which resulted in profuse hæmorrhage into the cyst cavity. The wound closed and the patient left the hospital perfectly well. He has not been heard from since.

SARCOMA OF PELVIC ORGANS NOT CONTROLLED BY
THE X-RAY OR BY COLEY'S FLUID.

DR. GEORGE ERETY SHOEMAKER said that some months ago he had occasion to report a sarcoma of the abdominal wall associated with an infiltration which united the rectum, uterus, left tube, and ovary, the growth not being considered removable after opening the abdomen. The wound was closed, and, after removing a generous piece from the superficial tumor for the microscope, the X-ray was applied for about nine months by Dr. William S. Newcomet. The total number of exposures was forty-nine. The after-result, one year later, was the total disappearance of the growth from the abdominal wall, the gain of sixteen pounds in weight, and the disappearance of all pelvic enlargement except a slight increase in the size of the uterus. The case was originally referred to him by Dr. M. B. Hartzell. The microscopical diagnosis was given by Dr. J. Dutton Steele. The case was reported before the College of Physicians. (*Transactions of the College of Physicians*, 1903; *American Medicine*, vol. vi, No. 26, December 26, 1903.)

He now reported another case which offered a contrast to the former favorable result, and though, from the circumstances which surrounded the patient, she was able to secure the very best conditions, and ample time was given to her treatment, no definite influence appeared to be exerted upon the progress of the disease either by the mixed toxins of Coley or by the prolonged use of the X-ray.

The patient was single, forty-six years old, and was referred to him by Dr. A. A. Long, of York, Pa., because of a tumor in the right side of the abdomen, from which a sharp nodule projected against the right internal inguinal ring. As a right inguinal hernia had existed for six years, the pressure of the tumor against the hernia gave rise to a persistent pain and nausea, and was the principal source of the patient's distress. The tumor, which she had noticed about a year, reached to within an inch and a half of the navel on the right side, was nodular, sharply defined through the very thin abdominal wall, was evi-

dently connected with the uterus, and was movable. The inguinal hernia when opened was found to contain a pea-sized growth in the sac, which afterwards proved to be spindle-celled sarcoma. Radical cure of the hernia was done by the Bassini method, using kangaroo tendon.

On opening the abdomen in the median line with the intention of doing hysterectomy, the tumor was found to be made up of a number of small, tense cysts, very dark in color, protruding prominently from a fine granular base which was firm and solid. The uterus was completely covered in and its outlines could not be differentiated. No right broad ligament or ovary could be demonstrated; the growth involved the bladder superficially, and the rectum low down to a slight extent, and was not considered to be removable in the interest of the patient, though the entire mass, including the uterus, was movable. A nodule in the omentum was removed for examination and afterwards proved also to be sarcomatous. There was no unfavorable reaction from the operation, and immediately after aseptic convalescence X-ray was begun by Dr. W. S. Newcomet, and continued with slight intermission two or three times a week for about three months. While the patient at first improved in nutrition, no definite effect could be produced upon the size of the growth. Because of the radical cure of the hernia, it was no longer pressed upon by the tumor, and a distressing source of pain and nausea was completely removed.

The systematic use of the mixed toxins recommended by Dr. Coley was begun with a half-minim dose and gradually increased one minim per day. Reaction first occurred with twenty-one minims of the undiluted preparation. After this was secured, the injections were continued for seventeen days under his own observation in the hospital, and for several weeks longer in the very careful hands of her physician at her home. Though typical reactions were produced and though every possible arrangement was made for surrounding the patient with the best possible conditions, no permanent effect on the tumor was produced by the treatment, while the long-continued series of reactions was somewhat exhausting. The greatest amount of Coley's fluid used at one time was thirty-two minims. Specific treatment of the tumor was now abandoned. The patient gradually lost ground, and death occurred from exhaustion fourteen months after the operation.

The cystic degeneration of the sarcomatous growth probably rendered it less amenable to successful treatment by the X-ray. It was somewhat of a disappointment, however, to find that the toxin treatment failed to influence a sarcoma of the spindle-celled variety, which is the form most favorable for its use. Careful watch was maintained upon the blood condition during the use of both of the agents referred to, but no definite effect appeared to be produced upon the leucocytes. The lowest count was 6000 and the highest 10,600. The latter count was obtained during the period of X-ray treatment, and led to a cautious increase of interval so as to avoid breaking down the growth. The lowest hæmoglobin was 62 per cent. and the highest 79 per cent. The lowest red-cell count was 3,856,000 and the highest 4,960,000. Much of the improvement in the general condition of the blood occurred during the treatment with the X-ray, and may have been largely due to general hygienic and roborant measures, which were systematically carried out. Improvement in nutrition was also favored at this time by the absence of pain in the tumor and by its disappearance from the site of the former hernia.

DR. JOHN H. JOPSON spoke of a round-cell sarcoma of the neck upon which the combined treatment was used with marked success. The tumor was situated above the clavicle, and was the size of an orange when operated upon in May, 1904. Operation was difficult and the tumor could only partially be removed. It extended below the clavicle, into the anterior mediastinum, and along the posterior triangle of the neck. The internal jugular vein was infiltrated, and was torn three times during the dissection. The prognosis was very bad, but under treatment by Coley's fluid and the X-ray the infiltration remained stationary for some months. The fluid was begun with minim doses and increased until thirty-five or forty minims were reached. Finally, the tumor again enlarged, and further operation was considered and also advised by Dr. Willard. In December, 1904, the second operation was performed, and this showed that the infiltration of the posterior triangle and of the mediastinum had disappeared, and what remained of the tumor in the old site was surrounded by fibrous tissue in the form of a capsule. This made removal of the entire mass comparatively easy. Now, ten months after the first operation, there is some limited induration at the site

APPARATUS FOR RETAINING PATIENT IN POSITION. 135

of operation, but the patient's general health is good, and he is in excellent physical condition.

APPARATUS FOR RETAINING PATIENT IN ANY DESIRED POSITION.

DR. W. W. KEEN showed a posture retention apparatus, saying that it was demonstrated on board the Athos during their

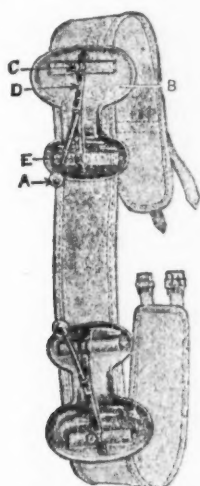


FIG. 1.—A. The retaining arm with ball attachment. B. The conformity supporting plate. C. The thumb-clamp for adjusting plate, B, on the bandage for retaining the body at any angle or in any posture. D is a rib secured to the conformity plate; this rib possessed with elevations, E, under which the bandage (or belt) passes these elevations to allow of readily attaching and detaching the belt for washing.

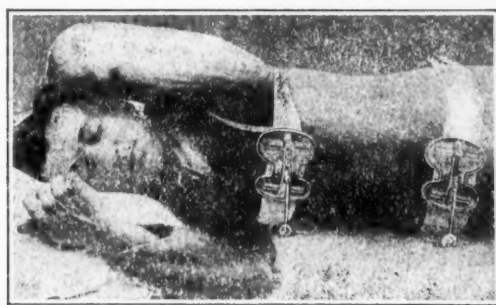


FIG. 2 shows patient being retained to the side during operation; two retainers (as seen in front resting against the operating table) are also on the back; thus the body is held rigidly to the lateral posture.

recent unfortunate trip to the tropics, by Mr. Lees, of the Physicians' Supply Company of Philadelphia. The apparatus is simply

a pair of broad bands of canvas, to each of which are attached two buckles carrying projections six inches long and terminating in spheres approximately three centimetres in diameter. It is used to retain patients in any position while sleeping, as, if properly applied, they cannot turn without first waking. While particularly to be used after operations, Mr. Lees believed it might also be of use in preventing nocturnal emissions. Dr. Keen also suggested that it would be useful in keeping patients in the lateral position during operations upon a kidney, the ilium, etc., as every surgeon knows the difficulty in keeping such patients from turning upon the back or face. He recently employed the apparatus upon a man from whom he removed a tumor of the buttock, applying one under the armpits, the other just below the hips. They retained the patient in the desired position throughout the operation without any difficulty, and were in every way satisfactory. The only objection to them is that they may cause pressure upon the chest, thus preventing free respirations. If modified by providing a slit for the arm or some similar device, they possibly might be employed for Estlander's or Schede's or other operations upon the chest requiring the lateral position.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, February 6, 1905.

D. A. K. STEELE, M.D., in the Chair.

ANKYLOSIS OF THE JAW.

DR. EMIL RIES reported the case of a man, twenty-one years of age, who was sent to him from Indiana six months after he had acquired syphilis. The patient's syphilis was at first treated by some irregular practitioner in an unknown way, and grew worse rapidly. He soon began to have ulceration of the mouth, though he did not remember ever having been salivated, and it was not known that this practitioner gave him mercury. At any rate, ulceration of the mouth began, and when the young man consulted a regular practitioner he was in a very bad condition. His tongue was swollen enormously; he could not close his mouth; his mouth was full of ulcerations; he lost almost all of his teeth on the left side; large pieces of bone began to come out. One day a very severe hæmorrhage from the mouth took place, which the doctor had difficulty in controlling. Then under antisyphilitic treatment this very bad condition became a little better, so that the tongue retired into the mouth and the patient could close the mouth. Very soon, however, he found that, whereas before he was unable to close his mouth, now he was unable to open it. The teeth of the left side having largely fallen out, he was able to feed himself on that side with a spoon, taking liquid food only. He noticed that part of the liquid food always escaped through the nose, so that feeding was rather difficult. At first his nutrition was very poor; he went down rapidly, but

gained in weight under antisyphilitic treatment and careful feeding, so that when he came to Chicago in November he was in fairly good general health. In October, when Dr. Ries first saw him, he still had syphilitic ulcerations in the mouth which did not heal quickly, and he gave directions for specific treatment. When he returned in November he could not move the lower jaw; half of the horizontal ramus of the jaw on the left side had disappeared, with the angle of the jaw. Between the condyloid process and the jaw there was only ligamentous union by cicatricial tissue. The median line of the lower jaw corresponded vertically with the left nasolabial fold, the jaw being pulled over to the left side. There was a perforation of the hard palate; there was a perforation of the septum. There were condylomata on the penis; the chancre was still hard; the glands were enlarged all over the body; but there were no mucous patches, no eruption on the skin. It seemed that the man was as much troubled by the bad mutilation of his face in consequence of the absence of the angle of the jaw as by his inability to open the mouth. He desired very much to have something done for the caving in of the left side of his face, and, in determining upon the method to be followed in the operation, the speaker took that into account, and instead of making an incision along the zygoma, as would ordinarily be practised, he decided to do an operation which would permit him to insert a sufficient artificial support for his face to make the left side correspond more to the other side. He intended to insert sufficient ivory pegs to give the appearance of a natural jaw. He therefore made an incision below the horizontal ramus, or where it ought to have been, and continued it up behind the ascending ramus; then dissected his way down to the bone and to the cicatricial tissue, and dissected out the facial nerve and its branches carefully so as to avoid wounding them. After they had been dissected out they could be seen beautifully; he raised these parts forward, and on the left side tried to remove the condyloid process, which was firmly adherent to the skull. The coronoid process was buried in scar tissue, with the scar tissue extending down into the mucous membrane of the mouth, so that he was in considerable danger of opening into the mouth, an occurrence which he was particularly anxious to avoid to guard against infection of the wound. He succeeded in avoiding opening into the mouth, and could resect with the chisel the condyloid process.

The coronoid process, which fastened the rest of the jaw to the scar tissue, he dissected out subperiosteally. Then he expected the jaw to be fairly movable. It was not. It was just as solid as it was before. Even after the condyloid process had been removed completely, there was no possibility of moving the jaw. He therefore decided that it would be necessary to operate on the other side also; and he sutured the pterygoid muscle out between the skull and the external soft parts so as to avoid new bony formation between the base of the skull and the jaw. He then proceeded in the same way on the right side, but it was sufficient to resect the condyloid process, as the coronoid process had not interfered sufficiently with the motion; and he again sutured the pterygoid muscle out between the skull and the rest of the descending ramus of the jaw. On the left side, after having finished the dissection, he drilled holes into the jaw and inserted ivory pegs. At first he had two pegs ready, but found that, if he drilled a sufficiently good hold for the second peg, he would run considerable risk of getting into the alveolar process and of opening into the mouth, and, of course, one could not expect pegs to hold for any length of time if they were in contact with the mouth cavity in any way. He therefore left one peg in place, which he could insert into the horizontal ramus, and which healed in beautifully. The wounds were closed completely by sutures, without drainage, and healed by primary union. At the end of the operation it was possible to open the mouth sufficiently to insert a good-sized piece of bread, or anything of that kind, so that the man would be able to eat solid food.

In the after-treatment he insisted on early and frequent passive motion; then he began to teach the man to speak again. His speech, when he came to him, was mumbling, very indistinct, in consequence of the formation of scar tissue in his mouth, and he actually had to relearn to speak. At the end of six weeks' treatment his mouth was clean and all right; the wounds were all healed; his mobility was very fair, and he proceeded to have a dentist insert a plate, first of all covering the opening into his nose, the perforation of the hard palate, and, secondly, to enable him to chew. He was then able to chew food, if it was not too hard, and when he left the hospital, about eight weeks after the operation, he was in good condition, and his face looked quite natural. There was still a little caving in on the left side, but the

ivory peg held up the skin so well that there was a marked apparent angle of the jaw, and the deep cavity which had existed at first on the left side had disappeared. Now, that the peg had healed in, he thought it would be an easy matter to build up with paraffin the side of the face, as there was something to build up on. The patient was going to return soon to have some more dental work done, and at that time the speaker expected to inject some paraffin.

EXTENSIVE RECTAL STRICTURES.

DR. RIES described a case which he had reported, first, seven years ago. At that time he operated upon a woman with syphilis of long-standing. She came to him with the complaint of constipation, vomiting, cachexia, suppuration from the rectum and vagina, and in whom he found on examination the following choice selection of conditions: Syphilis, with skin eruption; general enlargement of the glands; extreme cachexia, so that the woman, instead of weighing 160 pounds (her former weight), now weighed only eighty pounds; complete laceration of the perineum; rectovaginal fistula; stricture of the rectum, low down, and very tight, so that he could barely introduce a thin probe; laceration of the urethra; cystic tumors of both ovaries of moderate size, say about the size of a goose-egg. On vaginal examination the uterus was found atrophied and high up. Behind the uterus he found a hard mass, the nature of which he could not explain. He thought it was a case of mesosigmoiditis, which was associated frequently with ulcerative processes low down in the rectum or higher up in the sigmoid. He intended to resect the stricture of the rectum and bring down the sigmoid and attach it to the sphincter ani. He proceeded accordingly (June 19, 1897) through the vagina, and as he split the fistula he found it went through into the stricture. Above the stricture there was ulcerated rectal mucous membrane, and going higher up he came into the peritoneal cavity. In the peritoneal cavity he found a hard mass higher up, which was not simply a mesosigmoiditis, but a second stricture of the rectum, so that the following conditions confronted him. Diagram (Fig. 1) shows the symphysis, the bladder, with laceration of urethra; the vagina, with the uterus, the lacerated perineum, and fistula which led into the rectum.

Then the sacral bone, the upper stricture, the dilated, ulcerated portion of the rectum, with the lower stricture. After he had opened into the peritoneal cavity, it was clear that he could not have pulled down the bowel above the upper stricture from below without running serious risk. So he turned the patient round and did a laparotomy. The descending colon was loose to such an extent that there was a distinct mesentery, so that he cut

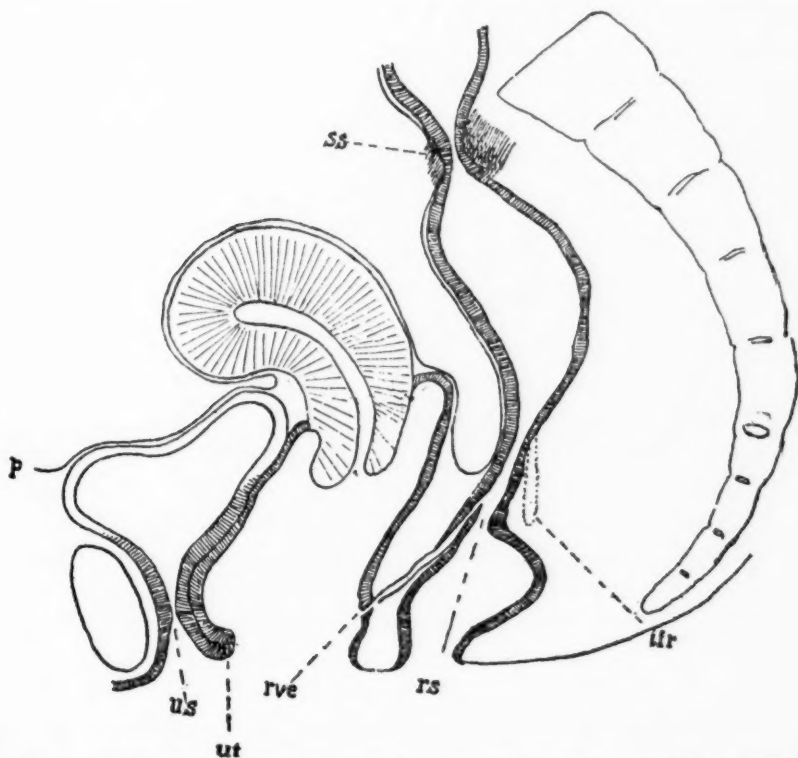


FIG. 1.—Condition before operation. *p*, Peritonæum. *ss*, Stricture of sigmoid. *rs*, Stricture of rectum. *ifr*, Internal fistula. *rve*, Rectovaginal fistula. *ut*, Urethral tear. *us*, Urethral stricture.

through above the upper stricture, and closed the lower part of the bowel completely. He took the descending colon, pulled it down through the opening in the cul-de-sac, and inserted it above the anus. There were therefore at the conclusion of the operation two rectums, a new one, which was made of the descending colon, and the old one, which contained two strictures, and an ulcerated area (Fig. 2). The anastomosis was made by sutures.

In other words, exclusion of the lower part of the bowel was performed. The woman made a smooth recovery, gained in flesh rapidly, and had no difficulty with her bowel movements after that for five years.

He reported this case to the Chicago Medical Society soon after it was operated upon. He also reported it to the Mississippi Valley Medical Association five years after the patient had been

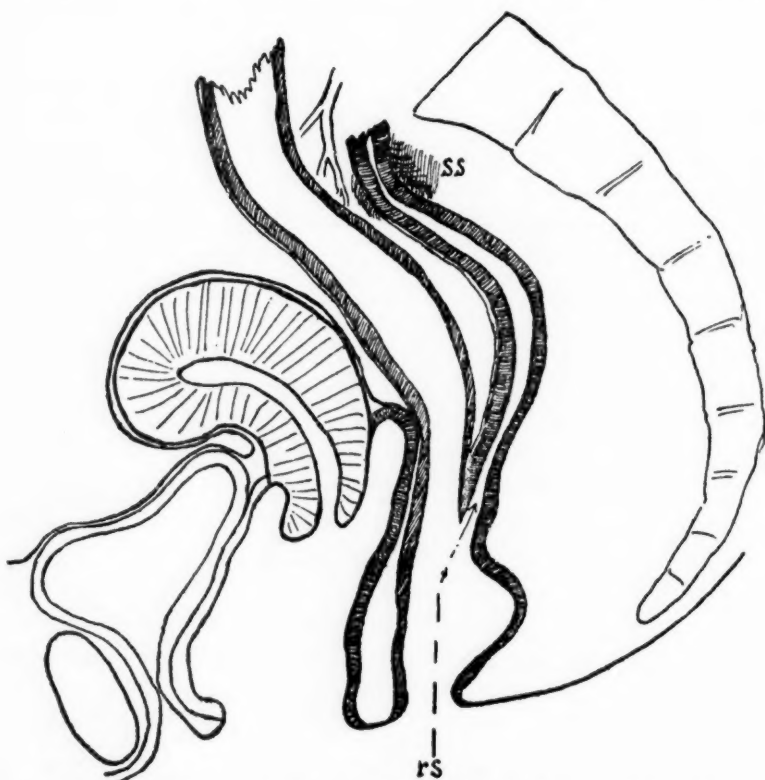


FIG. 2.—Operation completed. *rs*, Rectal stricture. *ss*, Stricture of sigmoid.

operated upon, when she weighed 160 pounds. At that time she was in perfect health. She complained of nothing, had done nothing for her syphilis, and could not be induced to take any kind of treatment. He saw the woman again two months ago, when her weight had been reduced to ninety-six pounds. She was cachectic, and the new rectum was as much strictured as the old one was before. The excluded bowel had shrivelled up com-

pletely, so that it was impossible to introduce a probe more than an inch. The rest was all closed up apparently by a cicatricial mass. The new artificial rectum had become strictured also, but the stricture was not so tight but what one could introduce a good-sized flexible bougie. The mass of cicatricial tissue around it was so extensive that there was little doubt in his mind but what the rectum would close completely. The body was covered with a specific eruption.

So far as he knew, this was the first case ever operated upon in this manner. The second case was operated upon by Rotter, of Berlin, about five weeks after Dr. Ries operated on his case; and that gentleman published a report of his case about ten months after he had operated, that is, over eleven months after Dr. Ries operated, he having the same idea in view. This gentleman had operated upon two additional cases since. One patient was dead, while the other two survived. Both had a recurrence, one two, and the other three, years after operation. Dr. Ries's case was the only one that had remained free from recurrence for over five years. He operated on her again last Saturday. It was interesting to go into the abdomen to see what the organs looked like at present. He expected, if he could get enough slack, enough movable colon descendens or transverse colon, to repeat the operation, and take the transverse colon and place it between the sacrum and vagina, and use it for a rectum. When he got in he found there was no slack. The descending colon, which was stretched at the time of the first operation, was smooth and laid almost immovably against the abdominal wall on the left side. There was no mesentery now on which to pull and drag in order to get the colon down to the sphincter ani. The transverse colon was not sufficiently movable to be cut in two and taken down into the pelvis. He therefore decided to do a colostomy, which he performed on Saturday. The woman was doing well so far.

DR. JACOB FRANK said that Dr. Beck had exhibited a case at a previous meeting of the Society in which he had excluded a portion of the bowel, and described a peculiar formation which took place in that excluded portion. He had had the same experience as Dr. Beck with regard to exclusion of the bowel, and also had demonstrated the same in experimental work on dogs. He did not know whether in Dr. Ries's case part of the bowel was completely excluded, or whether there was an opening at the

lower part, and he would like to have Dr. Ries speak of that in his closing remarks. He could not describe very well the particles of material that formed in the bowel, but so far as he could judge, they appeared to be of a cheesy nature, rolled up in little balls, and sometimes this material formed in such quantities that it gave patients excruciating pain. In one case, a woman, he had operated upon, the suffering was considerable, and he always thought when she came to him she complained simply of nothing. Why she complained, he did not know, because her bowels were moving; but the pain became so excruciating that he finally operated again, and found the condition he had mentioned. He would like to know whether Dr. Ries found anything of this kind in his case, or whether there was an opening through which the material could escape. This was the first case he knew of where the bowel became completely contracted to a small tube if both ends of the bowel were completely closed.

DR. RIES said, in reply to Dr. Frank, that the descending colon, which was pulled down, was inserted into the rectum just above the anus, and was not excluded at both ends, but only at one end. The excluded bowel was in an ulcerated and syphilitic condition, so that there was very little epithelium left. His patient was not bothered by the sebaceous or cheesy masses referred to by Dr. Frank. At first, there was a sort of mucous discharge from the rectum, but this soon stopped, and now one could not introduce a sound very far.

STRICTURE OF THE ŒSOPHAGUS FOLLOWING TYPHOID FEVER.

DR. S. C. PLUMMER presented a case of a young man, seventeen years of age, who, on September 21, 1903, took to his bed with typhoid fever. On October 15, while apparently convalescent, he suffered a relapse, and was severely ill for more than three weeks longer. Liquid diet was continued until about November 12. On this date he partook of semisolid diet for the first time, and noticed difficulty in swallowing, with frequent choking. This condition gradually grew worse, and about December 10 the attending physician began passing œsophageal sounds each day, until December 19, when patient was removed to another hospital. From December 19, 1903, to February 25,

1904, he received no treatment for the stricture, but from that date on a whalebone sound, with steel olive tips, was used.

On April 12 he became unable to swallow anything, even liquids, and was nourished by rectal alimentation. On April 18 he entered Wesley Hospital, Chicago, and on April 21 was anæsthetized with ether. An unsuccessful attempt was made to pass bougies of various sizes, and Dr. Plummer then proceeded to do a gastrostomy, using a vertical incision, with separation of the fibres of the rectus muscle, as advised by von Hacker. As it was impossible to enter the œsophagus through the cardiac orifice of the stomach, the stomach wall was stitched to the edges of the parietal peritoneum, and then opened. The edges of the stomach wound were not stitched to the skin, but brought up only slightly into the wound, and a drainage-tube inserted. It was not the aim to make a permanent fistula lined with mucous membrane, but it was hoped that the stricture of the œsophagus would relax, and the gastric fistula, after serving as a temporary route for nourishing the patient, might be allowed to close.

On April 27, six days after the operation, the patient could again swallow liquids. On the following day an attempt was made to pass a small bougie, but unsuccessfully. Several similarly unsuccessful attempts were made during the next few days. On May 4 the stricture again closed, so that liquids could not be swallowed, and on July 21 he gave up all hope of ever dilating the stricture, and the patient left the hospital. At this time he was strong and well nourished.

On August 26 he could again swallow liquids, and he returned to the hospital September 4. Attempts to pass bougies were unsuccessful, as before, so efforts were directed to getting something through the stricture by swallowing. Repeated efforts on the part of the patient failed, but on September 29 he informed Dr. Plummer that he thought a very fine silk thread had passed through. His stomach was quite full at the time, and upon removal of the tube, which was kept clamped with an artery forceps, there was a free escape of stomach contents, and the end of the thread floated out through the fistula. A heavier thread was at once attached to the mouth end of this one and drawn through the stricture, and to this a still larger thread attached and drawn through. The two ends of the latter were then tied together, first passing the stomach end through the drainage-tube. Each day

a larger thread was drawn through, and finally three of the largest were in place at one time. On October 18 a small drainage-tube was drawn through the stricture and allowed to remain two hours, then withdrawn, to be again drawn into place the next day. Every few days the size of the tube was increased, until early in January, 1905, a No. 14 catheter was used.

On January 11 the string was removed and the drainage-tube taken out of the fistula. A bougie was then passed through the stricture per mouth, and this had been continued every day or two up to the present time, when a No. 23 œsophageal bougie could be passed with ease.

On January 5, 1905, he began giving the patient thiosinamin, three grains, once a day. On January 12 this was increased to three grains twice a day, and on January 27 to three grains three times a day. On February 3 this was stopped, as patient complained of a feeling of weakness, which might, however, have resulted from his eating but a small amount of food, owing to the fact that his abdomen was strapped rather tightly with adhesive strips in the effort to close the fistula, and food when taken, except in moderate quantities, distressed him. The administration of the thiosinamin made it possible to increase the caliber of the bougies, and more rapidly than ever.

The fistula at this time (February 6) was about the diameter of a lead-pencil.

COLLOID CARCINOMA OF THE CÆCUM.

DR. PLUMMER reported the case of a female, aged twenty-five years, who in the summer of 1901 was seized with pain in the right iliac region. The onset was gradual, and followed in about forty-eight hours by vomiting and high fever. She remained in poor health for six weeks, when a diagnosis of appendicitis was made, and appendix removed. She recovered slowly after operation, but complained chiefly of weakness.

In August, 1903, patient began to have attacks of pain, vomiting, and fever, lasting ten to fourteen days at a time, with intervals of several weeks. Pain was cramping in character, and more generally distributed than before. The latter part of July, 1904, she noticed a slight swelling in the right iliac region. She had pain in the right iliac region, which radiated at times into

the right lower and upper extremities. She experienced some difficulty in walking. There was much distention of the bowels by gas, with constipation.

Examination revealed a firm mass, not adherent to the abdominal wall, with limited mobility.

Operation, September 22, 1904. A small incision was made over the tumor, and when the nature of the tumor mass was recognized, by examination through this opening, a long median incision was made. The ileum was divided near its lower end. Since it was found that the ascending mesocolon contained enlarged lymphatic glands, almost the entire ascending colon and its mesocolon were removed along with the cæcum, the colon being cut across near the hepatic flexure. The ends of the divided bowel were closed by two rows of sutures, and a lateral anastomosis was made by a Murphy button between the ileum and the transverse colon. The ileum was dilated and its walls much thickened. The abdomen was closed without drainage.

The patient had a tedious convalescence. For many days she suffered from great abdominal pain, with occasional emesis, and got very little sleep. Gradually, however, she improved, and on October 25 sat up in bed. The button did not pass until October 23, thirty-one days after the operation. On October 27 she was up in a wheel-chair, and on November 3 walked. When she left the hospital, November 24, 1904, she was in a fair condition, and when seen last, about January 1, 1905, was in vigorous health.

The fresh specimen showed the walls of the cæcum much thickened and indurated, with the lumen so reduced in size that the little finger could not be passed through it. Adherent to the cæcum was a colloid mass, almost the size and shape of a hen's egg; and there were several similar masses of smaller size in the immediate vicinity.

SARCOMATOUS DEGENERATION OF UTERINE MYOMA.

DR. E. C. DUDLEY exhibited a gross specimen and some slides of this case, and said that it was generally understood that sarcoma might develop from any of the following structures:

1. The interglandular connective tissue of the endometrium.
2. The intermuscular connective tissue of the myometrium.
3. The walls of the blood-vessels.
4. Perivascular connective tissue.
5. The muscle cells.
6. Any of the structures of a uterine myoma.

In the interesting specimen under consideration, it was evident from gross appearances that the sarcoma had developed from a uterine myoma. Before operation, the sarcomatous structure filled the uterine cavity, and felt on intra-uterine palpation like a retained placenta; in fact, was so pronounced by two excellent diagnosticians. Microscopic sections taken from various parts of the growth showed it to be a small, round, and spindle-celled sarcoma, the sarcomatous cells being substantially of the same size as the red corpuscles. The interesting features of this specimen were: (1) A rather sharp demarcation between the sarcomatous cells and the myomatous cells. (2) Presence in many parts of the sarcoma of clearly defined blood-vessel walls. (3) The transition in the character of the blood-vessels from those which have walls to those which are mere blood-spaces.

In this case complete abdominal hysterectomy was performed on the 17th of November, 1904. There was nothing unusual in the operation or in the subsequent recovery of the patient.

REVIEWS OF BOOKS.

MANUAL OF OPERATIVE SURGERY. By JOHN FAIRBAIRN BINNIE, A.M., C.M. (Aberdeen), Professor of Surgery, Kansas City Medical College, etc. Philadelphia: P. Blakiston's Son & Co.

This work on operative surgery is of exceptional merit. In a preface addressed to Dr. Robert F. Weir, to whom the book is dedicated, its scope is stated. It is not intended to describe the standard and well-established operations as done on the cadaver, but is rather a manual of the more recent advances along many lines.

Certain sections are omitted, viz., operations on the arteries, on bones, on joints, on the extremities, on the female pelvic organs, etc. Yet the number of things contained in this small book, which the average busy surgeon wants to know, is simply astounding. While it is not by any means devoid of originality, it still covers most of what is best in the recent literature of surgical operations. It shows a full acquaintance with the latest work of the various surgeons who have made material advancement along the lines to which they have devoted especial attention, when such attention has been crowned by success. Thus it is more comprehensive than a "one-man book."

To enumerate the many sections that will interest the reader may be unnecessary, but special attention may be drawn to some of them.

The book begins with a description of the modern methods of opening the skull, and continues with an excellent account of the operations for infectious conditions due to middle ear disease, laying stress on the advantages of using a burr-drill.

The description of the plastic operations on the face, chin,

lip, etc., contains Brophy's methods of closing cleft palates, well illustrated, from *Dental Cosmos*.

The chapters on the removal of cervical tumors and glands encourage systematic, operative attack, and give details and reasons for the various steps which, if followed, would improve our work.

The total excision of the cervical sympathetic is described according to Jonnesco.

Kocher's plan of dealing with the thyroid gland is given and illustrated.

Ten illustrations show the various methods of closing the abdominal wall, and the author concludes his few remarks on the subject with the statement that "after completing a prolonged operation on an exhausted individual, it is better to have a post-operative hernia in a living patient than a perfectly closed wound in a corpse."

The chapter on stomach surgery is especially strong and chronicles the advanced work of many surgeons, especially Mayo Robson and the Mayos. It includes some excellent illustrations.

In the section on the intestines, he advocates suturing without mechanical devices, and recommends an enterostomy in debilitated cases of intestinal obstruction. Our knowledge of appendicitis operative methods is well classified and succinctly stated.

He warmly advocates the "Fowler position" in the after-treatment of peritonitis. His use of iodoform gauze drainage and of the Ochsner plan of treatment of cases over forty-eight hours' duration will not be universally accepted. In the abundant use of gauze packing in abscess cases and its retention for ten days, he differs from the practice of some operators.

The short but excellent chapter on the bile ducts is to be especially commended, and it has many references to Robson and Mayo.

Hernia is well treated and the improved Johns Hopkins operation for inguinal, and the Mayo operation for umbilical,

hernia are given the space they well merit and are fully illustrated.

About one-sixth of the book is devoted to genito-urinary surgery, and includes the recent advances in this department.

Six methods for nephropexy are given and some of the advantages claimed for each. The other operations on the kidney are given due attention, but he is non-committal in reference to Edebohls' decortication procedure. In the chapter on the ureter, he has made free use of Morris's work, and could have found no better authority.

The various methods of dealing with paralysis by tendon transplantation are described and credit given to Vulpius and others.

Many other chapters might be mentioned as showing the scope of the work. In the perusal of the entire book, one is impressed with the fact that, to a great extent, only the more recent authorities are quoted. The very latest surgical literature is embodied in the book. While an active surgeon, who is also a student, may be acquainted with the very article quoted, it is convenient to find it at hand on one's desk rather than in less accessible journal files. It is, however, much more than a compilation. The vigor and good judgment of the author are everywhere apparent.

WALTER C. WOOD.

THE SURGERY OF THE DISEASES OF THE APPENDIX VERMIFORMIS AND THEIR COMPLICATIONS. By WILLIAM HENRY BATTLE, F.R.C.S., Surgeon to St. Thomas's Hospital, and EDRED M. CORNER, F.R.C.S., Surgeon in Charge of Out-Patients, St. Thomas's Hospital. Chicago: W. T. Keener & Co., 1905.

A book which can be read with interest and pleasure by the surgeon, and which is certainly a most valuable source of instruction to the general practitioner, as it is he who is usually first called to see the cases described, and upon whom rests the

responsibility of deciding when the surgeon shall be called in consultation, of urging upon the family or friends of the patient the need of haste that valuable lives be not sacrificed by unnecessary delay and waste of time.

Beginning with a brief history of the disease and its surgical treatment, the authors follow with a most complete description of the anatomy of the appendix, macroscopical and microscopical; its development, physiology, and relation to neighboring organs and the abdominal walls.

Almost forty pages are devoted to pathology and diagnosis, comprising really two most important chapters of the book.

There are but three criticisms to be made against the chapters devoted to treatment.

First. The authors recommend rubber gloves only in cases complicated by pus. We believe that gloves are *always* to be worn in this or any surgical procedure, whether pus be present or not.

Second. The evident preference given to silk as a suture material, when *absolutely* sterile catgut can always be obtained, plain or chromicized, of any desirable size from reliable manufacturers of surgical dressings.

Third. While the search for and removal of the appendix in cases with abscess may add somewhat to the risk to the patient, we believe it better to take that risk rather than close the abdomen, leaving such a factor for immediate or future trouble behind us.

The method of removal of the appendix described on pages 83 and 84 is quick, clean, and saves time, as we have proved on several occasions.

Chapter XII should be of special interest to all who are in any way connected with life insurance. Many companies now insure for or against appendicitis.

J. RICHARD TAYLOR.

"FRACTURES DE LA EXTREMIDAD INFERIOR DEL HÚMERO EN LOS NIÑOS." "FRACTURES OF THE LOWER EXTREMITY OF THE HUMERUS IN CHILDREN." Thesis presented by PEDRO CHUTRO. Gr. 8vo, pp. 577, Figs. 165. Buenos Ayres: J. Peuser, 1904.

This volume contains the results of Dr. Chutro's study of 106 elbow fractures in children observed by him during the period of five years from April, 1899, to April, 1904. During this time there were treated in all 361 cases of fractures in children, the fractures of the lower extremity of the humerus observed thus forming nearly 30 per cent. of the whole number. Of the 106 elbow fractures, 35 were supracondylar; 29 were epiphyseal separations; 28 were fractures of the external condyle; 2 of the internal condyle; 5 of the epitrochlea; 2 were classed as T-fractures; and 5 Dr. Chutro terms diacondylar, of the type Posadas. This last classification, named after the lamented Dr. Alexander Posadas, who first clearly described its pathological anatomy, is, as its name implies, a more or less transverse diacondylar fracture; its special feature being that the epiphyseal fragment of the humerus has become dislocated forward and downward into the flexure of the elbow, while the bones of the forearm form a false joint posteriorly with the lower end of the diaphyseal fragment of the humerus. Although the deformity is much the same as in that type of recent fracture described by Kocher as "supracondylar fracture by flexion," and though, as Chutro points out, fractures which were probably of this type have been described with more or less distinctness by various authors from the time of Cruveilhier (1829), yet no one appears to have studied the lesions accurately but Posadas himself.

The author of this work is to be sincerely congratulated upon the thorough and painstaking manner in which he presents his studies. His conclusions are amply justified in nearly every instance by the excellent series of skiagraphs and photographs with which his arguments are accompanied. The appearance of the

limb on admission is shown in a photograph; a skiagraph shows the bony lesions present; a complete clinical history is given; and when the patient is discharged he is again photographed and skiagraphed, to show the limits of extension and flexion in the elbow-joint, and the bony union obtained. Surprising success has attended the treatment in most of the cases; and this is no doubt in large part due to the adoption of acute flexion as the routine position for the elbow. Chutro gives Dauvergne (1873) the credit of introducing this method which is so widely known by Jones's name. Passive motion and massage are commenced at the first dressing, on the third or fourth day; and not until from five to six weeks have passed are bandages entirely discarded and gymnastics commenced. In our own opinion, it is safer not to begin massage or passive motion, except so much motion as is required to unfold and bathe the fold of the elbow, until the end of the second week; and if this be done we think it totally unnecessary to retain the bandages in the vast majority of cases beyond the fourth week. It also appears to us that Chutro depends upon the Röntgen rays for diagnosis to an unnecessary and inexpedient degree.

Chutro's experience with the operative treatment of elbow fractures appears to have been unusually extended. This is so, not because the cases under his own care required operation many times, but because children from the surrounding country for many miles appear to have been habitually referred to his department of the hospital. It is worthy of note that the cases thus sent in for operation had been treated, if any form of treatment had been employed, almost exclusively by the application of plaster casts; the result, as is frequently the case, being that the deformity recurred as soon as the cast became loose through the subsidence of the primary swelling, and that as a consequence the child was left with an ankylosed joint. In most of these cases he employed a single external longitudinal incision, reaching the humerus and radius through the intermuscular septum; then he separated the soft structures and the periosteum as a bridge from

the anterior surface of the joint, loosened the fragments, and replaced them in their normal position, cutting away so much of the callus or irregular edges of bone as was requisite. The arm was then dressed in acute flexion, and the case treated as a recent fracture. Formal excision of the joint is not employed; and, except in the cases of diacondylar fracture of the type Posadas, it was not found necessary to employ an internal longitudinal incision in addition to that formerly described.

In fractures of the external condyle, with complete rotation of the fragment, an injury very difficult to treat satisfactorily on conservative lines, Chutro employs immediate operation, restores the fragment to its normal position, and fastens it in place by periosteal sutures of catgut. He does not mention the method of nailing the fragment in place, and avoids metallic sutures whenever possible.

This volume may be considered a complete review of the subject of which it treats up to the present: the history of each variety of fracture is outlined, and the literature of the subject has been searched with a thoroughness which it would be difficult to exceed. A copious bibliography is appended, which is especially complete in American, English, and French references; the German literature is not so well represented. A fault in the book is the absence of an index; this lack is probably to be explained, however, on the ground that the work was presented as a thesis. As a whole, nevertheless, Dr. Chutro's book presents the best study of fractures of the lower extremity of the humerus which has been published in many years; and as far as illustrations alone are concerned it is certainly not excelled. Even to those who do not read Spanish, the magnificent series of photographs and radiographs will tell their own tale very largely, and will well repay careful study.

ASTLEY PASTON COOPER ASHHURST.

A LABORATORY MANUAL OF HUMAN ANATOMY. By LLEWELLYN F. BARKER, M.B. (Tor.), Professor and Head of the Department of Anatomy in the University of Chicago and Rush Medical College, Assisted by DEAN DE WITT LEWIS, A.B., M.D., and DANIEL GRAISBERRY REVELL, A.B., M.B., Instructor in Anatomy in the University of Chicago. Illustrated. Philadelphia and London: J. B. Lippincott Company, 1904.

It has been a great pleasure to review this book, first, because it is by far the most important work on practical anatomy that has appeared in recent years, and, second, because it sounds the new note in the modern teaching of anatomy.

In no branch of medical science have the methods of teaching received more radical change than anatomy. A few years ago the didactic lecture was the principal feature in the anatomical curriculum. The lecture was supplemented by dissections carried on in ill-lighted, badly ventilated, unhygienic rooms, where, through the blue haze of tobacco smoke, the student identified the grosser structures.

The changes wrought during the past decade have been modifications in methods, manners, and valuations. The value of the didactic lecture has been depreciated, the dissecting-room is far more important.

Froebel has influenced the pedagogics of medicine as well as the education of the child. "We learn by doing" is the spirit which permeates our instruction in anatomy. So is it that the Anatomical Laboratory has become the centre around which our anatomical education revolves. Everything else is subsidiary.

The Anatomical Laboratory has been dignified not alone by its educational importance, but by the atmosphere which pervades it. Here the student is taught cleanliness, the use of rubber gloves. Here is inculcated the habit of observation, examination, description. Not alone is the student required to dissect; he must draw important regions, model in clay the brain, the

bones, and joints; write descriptive essays concerning surgical landmarks.

The aim is not alone to dissect the part, but to make this the medium through which are moulded methods of thought invaluable in the practice of medicine.

The student must *see* for himself, and not rely upon what he is told to see. Individual effort makes strong men.

This is the trend of thought and the evident purpose of Professor Barker's book. The text is excellent, the illustrations ample, the nomenclature modern, the index complete. We congratulate the author in presenting to the profession a thoroughly modern work.

We commend the book to those who wish to possess a *modern* Laboratory Manual of Anatomy.

WILLIAM FRANCIS CAMPBELL.

THE CLINICAL STUDY OF BLOOD-PRESSURE: A Guide to the Use of the Sphygmomanometer, etc. By THEODORE C. JANEWAY, M.D., Lecturer on Medical Diagnosis, University and Bellevue Hospital Medical College, and Visiting Physician to the City Hospital, New York City. 8vo, pp. 300. New York and London: D. Appleton & Co., 1904.

Any means by which bedside observation may be rendered more exact cannot but be welcomed by the progressive clinician. The old method of estimating blood-pressure variations by means of the "educated touch" is not without value, but has probably had its day, and is even now giving way to the more exact manometric method, which, in the form of the modern sphygmomanometer is clinically applicable. The importance of carefully recording the variations in blood-pressure which occur during the course of disease has long been recognized, and the numerous observations, made chiefly by physiologists and pharmacologists, on the lower animals show how interdependent blood-pressure changes and other bodily phenomena are.

Unlike the sphygmograph, the sphygmomanometer has evidently come to stay; the physical principles upon which its construction is based being sound, and its clinical practicability having been established. A book, therefore, containing a clear and concise presentation of the principles of construction, the methods of use, the advantages and defects, and the chief data thus far obtained by means of the several forms of sphygmomanometer now available for office and bedside use,—such a book, in fact, as this one by Dr. Janeway,—should not only be welcomed by the medical profession, but should, and in all likelihood will, stimulate those of its members who are really interested in the improvement of clinical methods to the further investigation of the value of blood-pressure records as a means towards more exact diagnosis and prognosis, and more successful treatment.

The book is evidently the work of a cautious and painstaking investigator, one who is deeply interested in the subject, who values fact more highly than theory, who is as fully conscious of the limitations as of the advantages of the method he employs, and who is well versed in the literature of the subject.

JOHN C. CARDWELL.

CORRESPONDENCE.

CARGILE MEMBRANE.

EDITOR ANNALS OF SURGERY.

IN the ANNALS OF SURGERY for June, 1905, Dr. Albert B. Craig and Dr. Aller G. Ellis present a report upon experiments with Cargile membrane for the purpose of preventing peritoneal adhesions in dogs. The experiments also included work with nerves and tendons.

The authors believe that the membrane is not of service in preventing the formation of peritoneal adhesions. My own experiments were performed upon rabbits, and the reason why I took up the work was because of the beneficial effect of the membrane in two cases in which it was used for preventing recurrence of adhesions in patients.

The result of the experiments upon rabbits was definite enough to make me continue to use the resource in peritoneal work in my practice, and a conclusion would naturally be that in rabbits and in man the effect of the presence of the membrane in the peritoneal cavity is different from the effect in dogs. The peritoneums of different animals act very differently in response to irritants. Since my original report was published, I have had opportunity to learn of the practical value of the membrane in three cases in which the abdomen was reopened in patients several months after the primary application of the membrane. In one case in which I had separated very extensive bile-tract adhesions and applied the membrane, there was no recurrence of adhesion over the area covered by the membrane, but there were new distant adhesions. In a case in which I had separated very extensive adhesions following a pelvic peritonitis, and had applied the membrane, the patient returned for continued adhe-

sion irritation, and was able to locate definitely the points of new adhesion. About two-thirds of the area that had been covered with membrane remained free from adhesions, and the remaining third was in about the same condition as at the first operation, with firm, new adhesions. These were separated and more membrane applied, and the patient states that since the last operation she is entirely free from adhesion irritation. Her general gain in health and in appearance bears out the statement. In a third case in which I separated very extensive adhesions following appendicitis, the patient returned because of continued adhesion irritation. More than half of the area that had been covered with the membrane was free from adhesions, and the remaining half was as bad as before. Membrane was reapplied, and since that time the patient states that she is distinctly better, but feels that there are still points of adhesion. Her relief from adhesions has been so progressive, though not complete, that she wishes a third operation. When a patient returns for a third operation of the same sort, it is a fair presumption that the patient has noted well the effect of the former operations.

A number of patients for whom I have separated adhesions and have applied the membrane have made a satisfactory response. It is still a question in my mind if the Cargile membrane method is superior to the aristol film method, but each has its place, and both are satisfactory to the extent that I must use them continually in my own practice. There are cases in which one must operate more than once, however, but so long as he can count progress the procedure may fairly be classed as desirable surgery. I have one patient upon whom I have operated eight times, employing the aristol film method. The case was one of general peritonitis following a perforative sigmoiditis. Several feet of bowel were freed from adhesions at each operation, and at the last operation the bowel was so free from adhesions that no more work is contemplated.

ROBERT T. MORRIS, M.D.

NEW YORK, June 17, 1905.